



PORTFOLIO MANAGEMENT, CORPORATE ISSUERS, FINANCIAL STATEMENT ANALYSIS

CFA® Program Curriculum
2024 • LEVEL 1 • VOLUME 2

每年最新CFA FRM ESG等网课资料 一
手资源获取加微信 CFA185

©2023 by CFA Institute. All rights reserved. This copyright covers material written expressly for this volume by the editor/s as well as the compilation itself. It does not cover the individual selections herein that first appeared elsewhere. Permission to reprint these has been obtained by CFA Institute for this edition only. Further reproductions by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval systems, must be arranged with the individual copyright holders noted.

CFA®, Chartered Financial Analyst®, AIMR-PPS®, and GIPS® are just a few of the trademarks owned by CFA Institute. To view a list of CFA Institute trademarks and the Guide for Use of CFA Institute Marks, please visit our website at www.cfainstitute.org.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional should be sought.

All trademarks, service marks, registered trademarks, and registered service marks are the property of their respective owners and are used herein for identification purposes only.

ISBN 978-1-953337-50-4 (paper)

ISBN 978-1-953337-24-5 (ebook)

May 2023

CONTENTS

How to Use the CFA Program Curriculum	xiii
Errata	xiii
Designing Your Personal Study Program	xiii
CFA Institute Learning Ecosystem (LES)	xiv
Feedback	xiv
 Portfolio Management	
 Learning Module 1	
Portfolio Risk and Return: Part I	3
Introduction	3
Historical Return and Risk	4
Nominal Returns of Major US Asset Classes	5
Real Returns of Major US Asset Classes	6
Nominal and Real Returns of Asset Classes in Major Countries	7
Risk of Major Asset Classes	7
Risk–Return Trade-off	8
Other Investment Characteristics	8
Distributional Characteristics	9
Market Characteristics	11
Risk Aversion and Portfolio Selection	12
The Concept of Risk Aversion	12
Utility Theory and Indifference Curves	13
Indifference Curves	14
Application of Utility Theory to Portfolio Selection	18
Portfolio Risk & Portfolio of Two Risky Assets	21
Portfolio of Two Risky Assets	21
Portfolio of Many Risky Assets	30
Importance of Correlation in a Portfolio of Many Assets	31
The Power of Diversification	31
Correlation and Risk Diversification	33
Historical Risk and Correlation	33
Historical Correlation among Asset Classes	33
Avenues for Diversification	34
Efficient Frontier: Investment Opportunity Set & Minimum Variance Portfolios	37
Investment Opportunity Set	37
Minimum-Variance Portfolios	38
Efficient Frontier: A Risk-Free Asset and Many Risky Assets	40
Capital Allocation Line and Optimal Risky Portfolio	40
The Two-Fund Separation Theorem	41
Efficient Frontier: Optimal Investor Portfolio	43
Investor Preferences and Optimal Portfolios	48
Summary	48
Practice Problems	50

	<i>Solutions</i>	57
Learning Module 2	Portfolio Risk and Return: Part II	61
	Introduction	61
	Capital Market Theory: Risk-Free and Risky Assets	62
	Portfolio of Risk-Free and Risky Assets	62
	Capital Market Theory: The Capital Market Line	66
	Passive and Active Portfolios	66
	What Is the “Market”?	67
	The Capital Market Line (CML)	67
	Capital Market Theory: CML - Leveraged Portfolios	71
	Leveraged Portfolios with Different Lending and Borrowing Rates	72
	Systematic and Nonsystematic Risk	75
	Systematic Risk and Nonsystematic Risk	75
	Return Generating Models	77
	Return-Generating Models	77
	Decomposition of Total Risk for a Single-Index Model	79
	Return-Generating Models: The Market Model	79
	Calculation and Interpretation of Beta	80
	Estimation of Beta	82
	Beta and Expected Return	83
	Capital Asset Pricing Model: Assumptions and the Security Market Line	84
	Assumptions of the CAPM	85
	The Security Market Line	86
	Capital Asset Pricing Model: Applications	89
	Estimate of Expected Return	90
	Beyond CAPM: Limitations and Extensions of CAPM	91
	Limitations of the CAPM	91
	Extensions to the CAPM	93
	Portfolio Performance Appraisal Measures	94
	The Sharpe Ratio	95
	The Treynor Ratio	96
	M ² : Risk-Adjusted Performance (RAP)	96
	Jensen’s Alpha	97
	Applications of the CAPM in Portfolio Construction	100
	Security Characteristic Line	101
	Security Selection	101
	Implications of the CAPM for Portfolio Construction	103
	<i>Summary</i>	106
	<i>References</i>	108
	<i>Practice Problems</i>	109
	<i>Solutions</i>	116
Corporate Issuers		
Learning Module 1	Organizational Forms, Corporate Issuer Features, and Ownership	123
	Introduction	123
	Organizational Forms of Businesses	126

	Organizational Forms of Businesses	126
	Sole Trader or Proprietorship	127
	Partnerships	127
	Limited Companies	129
	Key Features of Corporate Issuers	135
	Legal Identity	135
	Owner–Manager Separation	135
	Owner/Shareholder Liability	136
	External Financing	136
	Taxation	138
	Publicly vs. Privately Owned Corporate Issuers	141
	Exchange Listing, Liquidity, and Price Transparency	142
	Share Issuance	143
	Registration and Disclosure Requirements	144
	Going from Private to Public	146
	Going from Public to Private	149
	The Varieties of Corporate Owners	149
	<i>Practice Problems</i>	153
	<i>Solutions</i>	155
Learning Module 2	Investors and Other Stakeholders	157
	Introduction	157
	Financial Claims of Lenders and Shareholders	159
	Debt Versus Equity	159
	Debt Versus Equity: Risk and Return	162
	Conflicts of Interest among Lenders and Shareholders	167
	Corporate Stakeholders and Governance	168
	Shareholders versus Stakeholders	169
	Investors	170
	Board of Directors	171
	Managers	171
	Employees	172
	Customers	172
	Suppliers	172
	Governments	172
	Corporate ESG Considerations	175
	Environmental Factors	177
	Social Factors	178
	Governance Factors	178
	Evaluating ESG-Related Risks and Opportunities	179
	<i>Practice Problems</i>	182
	<i>Solutions</i>	184
Learning Module 3	Corporate Governance: Conflicts, Mechanisms, Risks, and Benefits	187
	Introduction	187
	Stakeholder Conflicts and Management	190
	Shareholder, Board Director, and Manager Relationships	191
	Controlling and Minority Shareholder Relationships	192

	Shareholder versus Creditor Interests	193
	Corporate Governance Mechanisms	196
	Corporate Reporting and Transparency	197
	Shareholder Mechanisms	197
	Creditor Mechanisms	200
	Board and Management Mechanisms	200
	Employee Mechanisms	202
	Customer and Supplier Mechanisms	203
	Government Mechanisms	203
	Corporate Governance Risks and Benefits	205
	Operational Risks and Benefits	206
	Legal, Regulatory, and Reputational Risks and Benefits	207
	Financial Risks and Benefits	208
	<i>Practice Problems</i>	212
	<i>Solutions</i>	214
Learning Module 4	Working Capital and Liquidity	217
	Introduction	217
	Cash Conversion Cycle	221
	Liquidity	232
	Primary Liquidity Sources	233
	Secondary Liquidity Sources	234
	Factors Affecting Liquidity: Drags and Pulls	236
	Measuring and Evaluating Liquidity	237
	Managing Working Capital and Liquidity	243
	Working Capital Management	243
	Liquidity and Short-Term Funding	247
	<i>Practice Problems</i>	252
	<i>Solutions</i>	254
Learning Module 5	Capital Investments and Capital Allocation	255
	Introduction	255
	Capital Investments	259
	Going Concern Projects	261
	Regulatory Compliance Projects	262
	Expansion of Existing Business	262
	New Lines of Business and Other Projects	263
	Capital Allocation	265
	Net Present Value (NPV)	267
	Internal Rate of Return	270
	Return on Invested Capital	273
	Capital Allocation Principles and Pitfalls	278
	Capital Allocation Principles	279
	Capital Allocation Pitfalls	279
	Real Options	283
	<i>Practice Problems</i>	290
	<i>Solutions</i>	292

Learning Module 6	Capital Structure	295
	Introduction	295
	The Cost of Capital	298
	Factors Affecting Capital Structure	302
	Determinants of the Amount and Type of Financing Needed	303
	Determinants of the Costs of Debt and Equity	306
	Modigliani–Miller Capital Structure Propositions	313
	Capital Structure Irrelevance (MM Proposition I without Taxes)	314
	Higher Financial Leverage Raises the Cost of Equity (MM Proposition II without Taxes)	315
	Firm Value with Taxes (MM Proposition II with Taxes)	317
	Cost of Capital (MM Proposition II with Taxes)	318
	Cost of Financial Distress	320
	Optimal Capital Structure	322
	Target Weights and WACC	324
	Pecking Order Theory and Agency Costs	325
	<i>Practice Problems</i>	329
	<i>Solutions</i>	331
Learning Module 7	Business Models	333
	Introduction	333
	Defining the Business Model	335
	Business Model Features	336
	Pricing and Revenue Models	342
	The Value Proposition (Who + What + Where + How Much)	344
	Business Organization and Capabilities	345
	Business Model Types	350
	Conventional Business Models	350
	Business Model Variations	350
	Business Model Innovation	353
	Network Effects and Platform Business Models	353
	<i>Practice Problems</i>	359
	<i>Solutions</i>	361
Financial Statement Analysis		
Learning Module 1	Introduction to Financial Statement Analysis	365
	Introduction	366
	Financial Statement Analysis Framework	367
	Articulate the Purpose and Context of the Analysis	368
	Collect Data	369
	Process Data	369
	Analyze/Interpret the Data	370
	Develop and Communicate Conclusions and Recommendations	370
	Follow-Up	371
	Scope of Financial Statement Analysis	371
	Regulated Sources of Information	375
	International Organization of Securities Commissions	375

US Securities and Exchange Commission	376
Capital Markets Regulation in Europe	379
Financial Notes and Supplementary Schedules	380
Business and Geographic Segment Reporting	381
Management Commentary or Management's Discussion and Analysis	383
Auditor's Reports	384
Comparison of IFRS with Alternative Financial Reporting Systems	389
Monitoring Developments in Financial Reporting Standards	390
New Products or Types of Transactions	390
Evolving Standards and the Role of CFA Institute	390
Other Sources of Information	392
<i>Practice Problems</i>	394
<i>Solutions</i>	397

Learning Module 2

Analyzing Income Statements	399
Introduction	400
Revenue Recognition	401
General Principles	401
Accounting Standards for Revenue Recognition	402
Expense Recognition	407
General Principles	407
Capitalization versus Expensing	409
Capitalization of Interest Costs	417
Capitalization of Internal Development Costs	420
Implications for Financial Analysts: Expense Recognition	424
Non-Recurring Items	425
Unusual or Infrequent Items	425
Discontinued Operations	427
Changes in Accounting Policy	427
Changes in Scope and Exchange Rates	430
Earnings per Share	430
Simple versus Complex Capital Structure	431
Basic EPS	432
Diluted EPS: The If-Converted Method	434
Diluted EPS When a Company Has Convertible Preferred Stock Outstanding	434
Diluted EPS When a Company Has Convertible Debt Outstanding	435
Diluted EPS: The Treasury Stock Method	436
Other Issues with Diluted EPS and Changes in EPS	439
Changes in EPS	440
Income Statement Ratios and Common-Size Analysis	440
Common-Size Analysis of the Income Statement	440
Income Statement Ratios	443
<i>Practice Problems</i>	446
<i>Solutions</i>	450

Learning Module 3

Analyzing Balance Sheets	453
Introduction	453

	Intangible Assets	454
	Identifiable Intangibles	455
	Goodwill	459
	Financial Instruments	461
	Non-Current Liabilities	466
	Long-Term Financial Liabilities	467
	Deferred Tax Liabilities	468
	Ratios and Common-Size Analysis	468
	Common-Size Analysis of the Balance Sheet	469
	Some interesting general observations can be made from these data:	471
	Balance Sheet Ratios	476
	<i>Practice Problems</i>	479
	<i>Solutions</i>	482
Learning Module 4	Analyzing Statements of Cash Flows I	485
	Introduction	486
	Linkages between the Financial Statements	487
	Primary Financial Statements	487
	Relationship between Financial Statements	487
	Linkages Between Current Assets and Current Liabilities	489
	The Direct Method for Cash Flows from Operating Activities	493
	Operating Activities: Direct Method	494
	The Indirect Method for Cash Flows from Operating Activities	499
	Operating Activities: Indirect Method	500
	Conversion from the Indirect to Direct Method	502
	Method to Convert Cash Flow from Indirect to Direct	502
	Cash Flows from Investing Activities	503
	Cash Flows from Investing Activities	504
	Cash Flows from Financing Activities	506
	Cash Flow from Financing activities: Long-Term Debt and Common Stock	507
	Computing Dividends Paid	507
	Differences in Cash Flow Statements Prepared under US GAAP versus IFRS	508
	<i>Practice Problems</i>	511
	<i>Solutions</i>	515
Learning Module 5	Analyzing Statements of Cash Flows II	517
	Introduction	517
	Evaluating Sources and Uses of Cash	518
	Ratios and Common-Size Analysis	522
	Free Cash Flow Measures	528
	Cash Flow Statement Analysis: Cash Flow Ratios	530
	<i>Practice Problems</i>	533
	<i>Solutions</i>	534
Learning Module 6	Analysis of Inventories	535
	Introduction	535
	Inventory Valuation	536

	The Effects of Inflation and Deflation on Inventories, Costs of Sales, and Gross Margin	543
	Presentation and Disclosure	545
	Presentation and Disclosure	546
	Inventory Ratios	546
	<i>Practice Problems</i>	554
	<i>Solutions</i>	567
Learning Module 7	Analysis of Long-Term Assets	573
	Introduction	573
	Acquisition of Intangible Assets	574
	Intangible Assets Purchased in Situations Other Than Business Combinations	575
	Intangible Assets Developed Internally	575
	Intangible Assets Acquired in a Business Combination	577
	Impairment and Derecognition of Assets	579
	Impairment of Property, Plant, and Equipment	579
	Impairment of Intangible Assets with a Finite Life	581
	Impairment of Intangibles with Indefinite Lives	581
	Impairment of Long-Lived Assets Held for Sale	581
	Reversals of Impairments of Long-Lived Assets	582
	Derecognition	582
	Presentation and Disclosure	584
	Using Disclosures in Analysis	591
	<i>Practice Problems</i>	595
	<i>Solutions</i>	603
Learning Module 8	Topics in Long-Term Liabilities and Equity	607
	Introduction	607
	Leases	609
	Requirements for Lease Accounting	609
	Examples of Leases	609
	Advantages of Leasing	610
	Lease Classification as Finance or Operating	610
	Financial Reporting of Leases	612
	Lessee Accounting—IFRS	612
	Lessee Accounting—US GAAP	614
	Lessor Accounting	616
	Financial Reporting for Postemployment and Share-Based Compensation	
	Plans	618
	Employee Compensation	618
	Deferred Compensation	619
	Defined-Benefit Pension Plans	619
	Accounting for Defined-Benefit Plans under IFRS	620
	Accounting for Defined-Benefit Plan under US GAAP	620
	Pension-Related Disclosures	621
	Share-Based Compensation	622
	Stock Grants	625

Stock Options	625
Accounting for Stock Options	627
Other Types of Share-Based Compensation	628
Presentation and Disclosure	629
Presentation and Disclosure of Leases	629
Lessee Disclosure	629
Lessor Disclosure	631
Presentation and Disclosure of Postemployment Plans	632
Presentation and Disclosure of Share-Based Compensation	635
<i>Practice Problems</i>	638
<i>Solutions</i>	641
Glossary	G-1

How to Use the CFA Program Curriculum

The CFA® Program exams measure your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major CFA Program topic areas (www.cfainstitute.org/programs/cfa/curriculum/cbok)
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/programs/cfa/curriculum)
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from curriculum content covering a topic area: LOS are provided in candidate study sessions and at the beginning of each block of related content and the specific lesson that covers them. We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfa/curriculum/study-sessions), including the descriptions of LOS “command words” on the candidate resources page at www.cfainstitute.org.
- The CFA Program curriculum that candidates receive upon exam registration

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. You can learn more about the CBOK on our website: www.cfainstitute.org/programs/cfa/curriculum/cbok.

The entire curriculum, including the practice questions, is the basis for all exam questions and is selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK.

ERRATA

The curriculum development process is rigorous and includes multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, there are instances where we must make corrections. Curriculum errata are periodically updated and posted by exam level and test date online on the Curriculum Errata webpage (www.cfainstitute.org/en/programs/submit-errata). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

DESIGNING YOUR PERSONAL STUDY PROGRAM

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Review the LOS both before and after you study curriculum content to ensure that you have mastered the

applicable content and can demonstrate the knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will likely spend more time on some study sessions than on others.

CFA INSTITUTE LEARNING ECOSYSTEM (LES)

Your exam registration fee includes access to the CFA Program Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all of the curriculum content and practice questions and is organized as a series of short online lessons with associated practice questions. This tool is your one-stop location for all study materials, including practice questions and mock exams, and the primary method by which CFA Institute delivers your curriculum experience. The LES offers candidates additional practice questions to test their knowledge, and some questions in the LES provide a unique interactive experience.

PREREQUISITE KNOWLEDGE

The CFA® Program assumes basic knowledge of Economics, Quantitative Methods, and Financial Statements as presented in introductory university-level courses in Statistics, Economics, and Accounting. CFA Level I candidates who do not have a basic understanding of these concepts or would like to review these concepts can study from any of the three pre-read volumes.

FEEDBACK

Please send any comments or feedback to info@cfainstitute.org, and we will review your suggestions carefully.

Portfolio Management

LEARNING MODULE

1

Portfolio Risk and Return: Part I

by Vijay Singal, PhD, CFA.

*Vijay Singal, PhD, CFA, is at Virginia Tech (USA).***LEARNING OUTCOMES**

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe characteristics of the major asset classes that investors consider in forming portfolios
☐	explain risk aversion and its implications for portfolio selection
☐	explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line
☐	calculate and interpret the mean, variance, and covariance (or correlation) of asset returns based on historical data
☐	calculate and interpret portfolio standard deviation
☐	describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated
☐	describe and interpret the minimum-variance and efficient frontiers of risky assets and the global minimum-variance portfolio

INTRODUCTION

1

Construction of an optimal portfolio is an important objective for an investor. In this reading, we will explore the process of examining the risk and return characteristics of individual assets, creating all possible portfolios, selecting the most efficient portfolios, and ultimately choosing the optimal portfolio tailored to the individual in question.

During the process of constructing the optimal portfolio, several factors and investment characteristics are considered. The most important of those factors are risk and return of the individual assets under consideration. Correlations among individual assets along with risk and return are important determinants of portfolio risk. Creating a portfolio for an investor requires an understanding of the risk profile of the investor. Although we will not discuss the process of determining risk aversion for individuals or institutional investors, it is necessary to obtain such information for making an informed decision. In this reading, we will explain the broad types of investors and how their risk–return preferences can be formalized to select the optimal portfolio from among the infinite portfolios contained in the investment opportunity set.

The reading is organized as follows: Sections 2–3 discuss the investment characteristics of assets. Sections 4–6 discuss risk aversion and how indifference curves, which incorporate individual preferences, can be constructed. The indifference curves are then applied to the selection of an optimal portfolio using two risky assets. Sections 7–9 provide an understanding and computation of portfolio risk. The role of correlation and diversification of portfolio risk are examined in detail. Sections 10–12 begins with the risky assets available to investors and constructs a large number of risky portfolios. It illustrates the process of narrowing the choices to an efficient set of risky portfolios before identifying the optimal risky portfolio. The risky portfolio is combined with investor risk preferences to generate the investor's optimal portfolio. A summary concludes this reading.

2

HISTORICAL RETURN AND RISK



describe characteristics of the major asset classes that investors consider in forming portfolios

Before examining historical data, it is useful to distinguish between the historical mean return and expected return, which are very different concepts but easy to confuse. Historical return is what was actually earned in the *past*, whereas expected return is what an investor anticipates to earn in the *future*.

Expected return is the nominal return that would cause the marginal investor to invest in an asset based on the real risk-free interest rate (r_{rF}), expected inflation [$E(\pi)$], and expected risk premium for the risk of the asset [$E(RP)$]. The real risk-free interest rate is expected to be positive as compensation for postponing consumption. Similarly, the risk premium is expected to be positive in most cases.¹ The expected inflation rate is generally positive, except when the economy is in a deflationary state and prices are falling. Thus, expected return is generally positive. The relationship between the expected return and the real risk-free interest rate, inflation rate, and risk premium can be expressed by the following equation:

$$1 + E(R) = (1 + r_{rF}) \times [1 + E(\pi)] \times [1 + E(RP)]$$

The historical mean return for investment in a particular asset, however, is obtained from the actual return that was earned by an investor. Because the investment is risky, there is no guarantee that the actual return will be equal to the expected return. In fact, it is very unlikely that the two returns are equal for a specific time period being considered. Given a long enough period of time, we can *expect* that the future (expected) return will equal the average historical return. Unfortunately, we do not know how long that period is—10 years, 50 years, or 100 years. As a practical matter, we often assume that the historical mean return is an adequate representation of the expected return, although this assumption may not be accurate. For example, Exhibit 1 shows that the historical equity returns in the last eight years (2010–2017) for large US company stocks were positive whereas the actual return was negative the prior decade, but nearly always positive historically. Nonetheless, longer-term returns (1926–2017) were positive and could be consistent with expected return. Though it is unknown if the historical mean returns accurately represent expected returns, it is an assumption that is commonly made.

¹ There are exceptions when an asset reduces overall risk of a portfolio. We will consider those exceptions in Section 14.

Exhibit 1: Risk and Return for US Asset Classes by Decade (%)

		1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s*	1926–2017
Large company stocks	Return	–0.1	9.2	19.4	7.8	5.9	17.6	18.2	–1.0	13.9	10.2
	Risk	41.6	17.5	14.1	13.1	17.2	19.4	15.9	16.3	13.6	19.8
Small company stocks	Return	1.4	20.7	16.9	15.5	11.5	15.8	15.1	6.3	14.8	12.1
	Risk	78.6	34.5	14.4	21.5	30.8	22.5	20.2	26.1	19.4	31.7
Long-term corporate bonds	Return	6.9	2.7	1	1.7	6.2	13	8.4	7.7	8.3	6.1
	Risk	5.3	1.8	4.4	4.9	8.7	14.1	6.9	11.7	8.8	8.3
Long-term government bonds	Return	4.9	3.2	–0.1	1.4	5.5	12.6	8.8	7.7	6.8	5.5
	Risk	5.3	2.8	4.6	6	8.7	16	8.9	12.4	10.8	9.9
Treasury bills	Return	0.6	0.4	1.9	3.9	6.3	8.9	4.9	2.8	0.2	3.4
	Risk	0.2	0.1	0.2	0.4	0.6	0.9	0.4	0.6	0.1	3.1
Inflation	Return	–2.0	5.4	2.2	2.5	7.4	5.1	2.9	2.5	1.7	2.9
	Risk	2.5	3.1	1.2	0.7	1.2	1.3	0.7	1.6	1.1	4.0

* Through 31 December 2017

Note: Returns are measured as annualized geometric mean returns.

Risk is measured by annualizing monthly standard deviations.

Source: 2018 SBBi Yearbook (Exhibits 1.2, 1.3, 2.3 and 6.2).

Going forward, be sure to distinguish between expected return and historical mean return. We will alert the reader whenever historical returns are used to estimate expected returns.

Nominal Returns of Major US Asset Classes

We focus on three major asset categories in Exhibit 1: stocks, bonds, and T-bills. The mean nominal returns for US asset classes are reported decade by decade since the 1930s. The total for the 1926–2017 period is in the last column. All returns are annual geometric mean returns. Large company stocks had an overall annual return of 10.2 percent during the 92-year period. The return was negative in the 1930s and 2000s, and positive in all remaining decades. The 1950s and 1990s were the best decades for large company stocks. Small company stocks fared even better. The nominal return was never negative for any decade, and had double-digit growth in all decades except two, leading to an overall 92-year annual return of 12.1 percent.

Long-term corporate bonds and long-term government bonds earned overall returns of 6.1 percent and 5.5 percent, respectively. The corporate bonds did not have a single negative decade, although government bonds recorded a negative return in the 1950s when stocks were doing extremely well. Bonds also had some excellent decades, earning double-digit returns in the 1980s and 2000s.

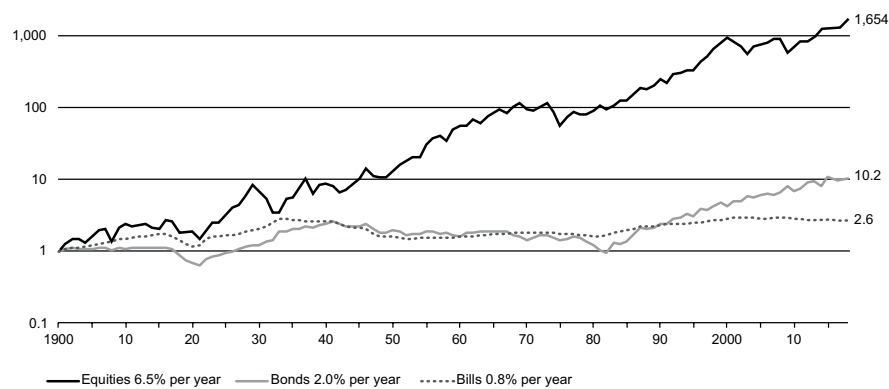
Treasury bills (short-term government securities) did not earn a negative return in any decade. In fact, Treasury bills earned a negative return only in 1938 (–0.02 percent) when the inflation rate was –2.78 percent. Consistently positive returns for Treasury bills are not surprising because nominal interest rates are almost never negative and the Treasury bills suffer from little interest rate or inflation risk. Since the Great Depression, there has been no deflation in any decade, although inflation rates were highly negative in 1930 (–6.03 percent), 1931 (–9.52 percent), and 1932 (–10.30 percent). Conversely, inflation rates were very high in the late 1970s and early

1980s, reaching 13.31 percent in 1979. Inflation rates have been largely range bound between 1 and 3 percent from 1991 to 2017. Overall, the inflation rate was 2.9 percent for the 92-year period.

Real Returns of Major US Asset Classes

Because annual inflation rates can vary greatly, from -10.30 percent to $+13.31$ percent in the last 92 years, comparisons across various time periods are difficult and misleading using nominal returns. Therefore, it is more effective to rely on real returns. Real returns on stocks, bonds, and T-bills are reported from 1900 in Exhibit 2 and Exhibit 3.

Exhibit 2: Cumulative Returns on US Asset Classes in Real Terms, 1900–2017



Source: E. Dimson, P. Marsh, and M. Staunton, *Credit Suisse Global Investment Returns Yearbook 2018*, Credit Suisse Research Institute (February 2018). This chart is updated annually and can be found at <https://www.credit-suisse.com/media/assets/corporate/docs/about-us/media/media-release/2018/02/giry-summary-2018.pdf>.

Exhibit 2 shows that \$1 would have grown to \$1,654 if invested in stocks, to only \$10.20 if invested in bonds, and to \$2.60 if invested in T-bills. The difference in growth among the three asset categories is huge, although the difference in real returns does not seem that large: 6.5 percent per year for equities compared with 2.0 percent per year for bonds. This difference represents the effect of compounding over a 118-year period.

Exhibit 3 reports real rates of return. As we discussed earlier and as shown in the table, geometric mean is never greater than the arithmetic mean. Our analysis of returns focuses on the geometric mean because it is a more accurate representation of returns for multiple holding periods than the arithmetic mean. We observe that the real returns for stocks are higher than the real returns for bonds.

Exhibit 3: Real Returns and Risk Premiums for Asset Classes (1900–2017)

		United States			World			World excluding United States		
	Asset	GM (%)	AM (%)	SD (%)	GM (%)	AM (%)	SD (%)	GM (%)	AM (%)	SD (%)
Real Returns	Equities	6.5	8.4	20.0	5.2	6.6	17.4	4.5	6.2	18.9
	Bonds	2.0	2.5	10.4	2.0	2.5	11.0	1.7	2.7	14.4
Premiums	Equities vs. bonds	4.4	6.5	20.7	3.2	4.4	15.3	2.8	3.8	14.4

Note: All returns are in percent per annum measured in US\$. GM = geometric mean, AM = arithmetic mean, SD = standard deviation.

"World" consists of 21 developed countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, United Kingdom, and the United States. Weighting is by each country's relative market capitalization size. See source for details of calculations.

Source: Credit Suisse Global Investment Returns Sourcebook, 2018.

Nominal and Real Returns of Asset Classes in Major Countries

Along with US returns, real returns of major asset classes for a 21-country world and the world excluding the United States are also presented in Exhibit 3. Equity returns are weighted by each country's GDP before 1968 because of a lack of reliable market capitalization data. Returns are weighted by a country's market capitalization beginning with 1968. Similarly, bond returns are defined by a 21-country bond index, except GDP is used to create the weights because equity market capitalization weighting is inappropriate for a bond index and bond market capitalizations were not readily available.

The real geometric mean return for the world stock index over the last 117 years was 5.2 percent, and bonds had a real geometric mean return of 2.0 percent. The real geometric mean return for the world excluding the United States were 4.5 percent for stocks and 1.7 percent for bonds. For both stocks and bonds, the United States earned higher returns than the world excluding the United States. Similarly, real returns for stocks and bonds in the United States were higher than the real returns for rest of the world.

Risk of Major Asset Classes

Risk for major asset classes in the United States is reported for 1926–2017 in Exhibit 1, and the risk for major asset classes for the United States, the world, and the world excluding the United States are reported for 1900–2017 in Exhibit 3. Exhibit 1 shows that US small company stocks had the highest risk, 31.7 percent, followed by US large company stocks, 19.8 percent. Long-term government bonds and long-term corporate bonds had lower risk at 9.9 percent and 8.3 percent, with Treasury bills having the lowest risk at about 3.1 percent.

Exhibit 3 shows that the risk for world stocks is 17.4 percent and for world bonds is 11.0 percent. The world excluding the United States has risks of 18.9 percent for stocks and 14.4 percent for bonds. The effect of diversification is apparent when world risk is compared with US risk and world excluding US risk. Although the risk of US stocks is 20.0 percent and the risk of world excluding US stocks is 18.9 percent, the combination gives a risk of only 17.4 percent for world stocks.

Risk–Return Trade-off

The expression “risk–return trade-off” refers to the positive relationship between expected risk and return. In other words, a higher return is not possible to attain in **efficient markets** and over long periods of time without accepting higher risk. Expected returns should be greater for assets with greater risk.

The historical data presented above show the risk–return trade-off. Exhibit 1 shows for the United States that small company stocks had higher risk and higher return than large company stocks. Large company stocks had higher returns and higher risk than both long-term corporate bonds and government bonds. Bonds had higher returns and higher risk than Treasury bills. Uncharacteristically, however, long-term government bonds had higher total risk than long-term corporate bonds, although the returns of corporate bonds were slightly higher. These factors do not mean that long-term government bonds had greater default risk, just that they were more variable than corporate bonds during this historic period.

Exhibit 3 reveals that the risk and return for stocks were the highest of the asset classes, and the risk and return for bonds were lower than stocks for the United States, the world, and the world excluding the United States.

Another way of looking at the risk–return trade-off is to focus on the **risk premium**, which is the extra return investors can expect for assuming additional risk, after accounting for the risk-free interest rate. The nominal risk premium is the nominal risky return minus the nominal risk-free rate (which includes both compensation for expected inflation and the real risk-free interest rate). The real risk premium is the real risky return minus the real risk-free rate. Worldwide equity risk premiums reported at the bottom of Exhibit 3 show that equities outperformed bonds. Investors in equities earned a higher return than investors in bonds because of the higher risk in equities.

A more dramatic representation of the risk–return trade-off is shown in Exhibit 2, which shows the cumulative returns of US asset classes in real terms. The line representing T-bills is much less volatile than the other lines. Adjusted for inflation, the average real return on T-bills was 0.8 percent per year. The line representing bonds is more volatile than the line for T-bills but less volatile than the line representing stocks. The total return for equities including dividends and capital gains shows how \$1 invested at the beginning of 1900 grows to \$1,654, generating an annualized return of 6.5 percent in real terms.

Over long periods of time, we observe that higher risk does result in higher mean returns. Thus, it is reasonable to claim that, over the long term, market prices reward higher risk with higher returns, which is a characteristic of a risk-averse investor, a topic that we discuss in Section 9.

3

OTHER INVESTMENT CHARACTERISTICS



describe characteristics of the major asset classes that investors consider in forming portfolios

In evaluating investments using only the mean (expected return) and variance (risk), we are implicitly making two important assumptions: 1) that the returns are normally distributed and can be fully characterized by their means and variances and 2) that markets are not only informationally efficient but that they are also operationally efficient. To the extent that these assumptions are violated, we need to consider additional investment characteristics. These are discussed below.

Distributional Characteristics

As explained in an earlier reading, a **normal distribution** has three main characteristics: its mean and median are equal; it is completely defined by two parameters, mean and variance; and it is symmetric around its mean with:

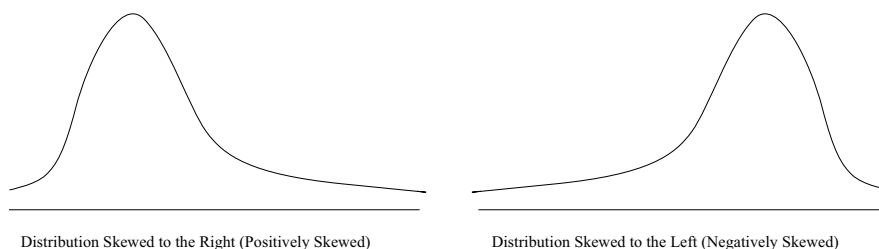
- 68 percent of the observations within $\pm 1\sigma$ of the mean,
- 95 percent of the observations within $\pm 2\sigma$ of the mean, and
- 99 percent of the observations within $\pm 3\sigma$ of the mean.

Using only mean and variance would be appropriate to evaluate investments if returns were distributed normally. Returns, however, are not normally distributed; deviations from normality occur both because the returns are skewed, which means they are not symmetric around the mean, and because the probability of extreme events is significantly greater than what a normal distribution would suggest. The latter deviation is referred to as kurtosis or fat tails in a return distribution. The next sections discuss these deviations more in-depth.

Skewness

Skewness refers to asymmetry of the return distribution, that is, returns are not symmetric around the mean. A distribution is said to be left skewed or negatively skewed if most of the distribution is concentrated to the right, and right skewed or positively skewed if most is concentrated to the left. Exhibit 4 shows a typical representation of negative and positive skewness, whereas Exhibit 5 demonstrates the negative skewness of stock returns by plotting a histogram of US large company stock returns for 1926–2017.

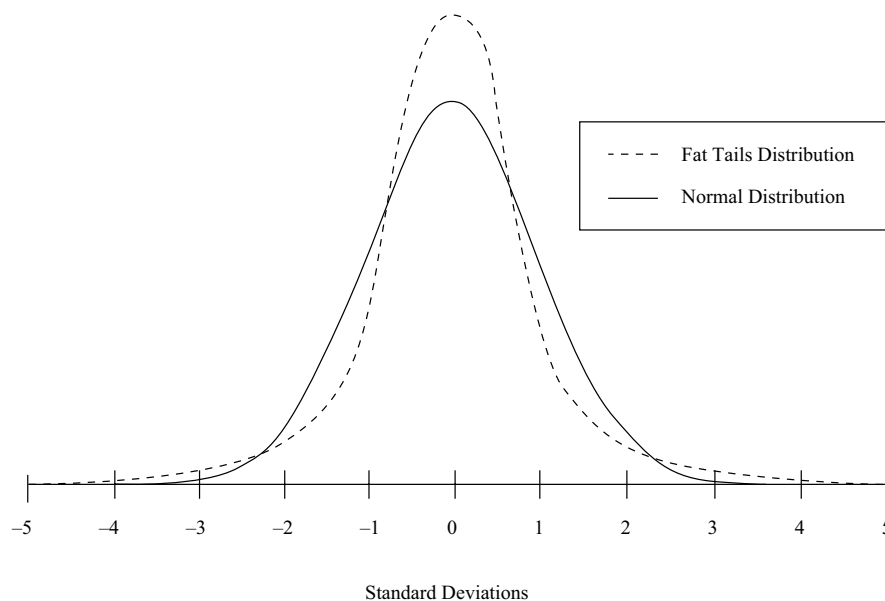
Exhibit 4: Skewness



Source: Reprinted from *Fixed Income Readings for the Chartered Financial Analyst® Program*.
Copyright CFA Institute.

Source: 2018 SBBI Yearbook (Appendix A1)

3 For example, see Bogle (2008) and Taleb (2007).

Exhibit 6: Kurtosis

Source: Reprinted from *Fixed Income Readings for the Chartered Financial Analyst® Program*.
Copyright CFA Institute.

Market Characteristics

In the previous analysis, we implicitly assumed that markets are both informationally and operationally efficient. Although informational efficiency of markets is a topic beyond the purview of this reading, we should highlight certain operational limitations of the market that affect the choice of investments. One such limitation is **liquidity**.

The cost of trading has three main components—brokerage commission, bid–ask spread, and price impact. Liquidity affects the latter two. Stocks with low liquidity can have wide bid–ask spreads. The bid–ask spread, which is the difference between the buying price and the selling price, is incurred as a cost of trading a security. The larger the bid–ask spread, the higher the cost of trading. If a \$100 stock has a spread of 10 cents, the bid–ask spread is only 0.1 percent ($\$0.10/\$100$). On the other hand, if a \$10 stock has a spread of 10 cents, the bid–ask spread is 1 percent. Clearly, the \$10 stock is more expensive to trade and an investor will need to earn 0.9 percent extra to make up the higher cost of trading relative to the \$100 stock.

Liquidity also has implications for the price impact of trade. Price impact refers to how the price moves in response to an order in the market. Small orders usually have little impact, especially for liquid stocks. For example, an order to buy 100 shares of a \$100 stock with a spread of 1 cent may have no effect on the price. On the other hand, an order to buy 100,000 shares may have a significant impact on the price as the buyer has to induce more and more stockholders to tender their shares. The extent of the price impact depends on the liquidity of the stock. A stock that trades millions of shares a day may be less affected than a stock that trades only a few hundred thousand shares a day. Investors, especially institutional investors managing large sums of money, must keep the liquidity of a stock in mind when making investment decisions.

Liquidity is a bigger concern in emerging markets than in developed markets because of the smaller volume of trading in those markets. Similarly, liquidity is a more important concern in corporate bond markets and especially for bonds of lower

credit quality than in equity markets because an individual corporate bond issue may not trade for several days or weeks. This certainly became apparent during the global financial crisis.

There are other market-related characteristics that affect investment decisions because they might instill greater confidence in the security or might affect the costs of doing business. These include analyst coverage, availability of information, firm size, etc. These characteristics about companies and financial markets are essential components of investment decision making.

4

RISK AVERSION AND PORTFOLIO SELECTION



explain risk aversion and its implications for portfolio selection

As we have seen, stocks, bonds, and T-bills provide different levels of returns and have different levels of risk. Although investment in equities may be appropriate for one investor, another investor may not be inclined to accept the risk that accompanies a share of stock and may prefer to hold more cash. In the last section, we considered investment characteristics of assets in understanding their risk and return. In this section, we consider the characteristics of investors, both individual and institutional, in an attempt to pair the right kind of investors with the right kind of investments.

First, we discuss risk aversion and utility theory. Later we discuss their implications for portfolio selection.

The Concept of Risk Aversion

The concept of **risk aversion** is related to the behavior of individuals under uncertainty. Assume that an individual is offered two alternatives: one where he will get £50 for sure and the other is a gamble with a 50 percent chance that he gets £100 and 50 percent chance that he gets nothing. The expected value in both cases is £50, one with certainty and the other with uncertainty. What will an investor choose? There are three possibilities: an investor chooses the gamble, the investor chooses £50 with certainty, or the investor is indifferent. Let us consider each in turn. However, please understand that this is only a representative example, and a single choice does not determine the risk aversion of an investor.

Risk Seeking

If an investor chooses the gamble, then the investor is said to be risk loving or risk seeking. The gamble has an uncertain outcome, but with the same expected value as the guaranteed outcome. Thus, an investor choosing the gamble means that the investor gets extra “utility” from the uncertainty associated with the gamble. How much is that extra utility worth? Would the investor be willing to accept a smaller expected value because he gets extra utility from risk? Indeed, risk seekers will accept less return because of the risk that accompanies the gamble. For example, a risk seeker may choose a gamble with an expected value of £45 in preference to a guaranteed outcome of £50.

There is a little bit of gambling instinct in many of us. People buy lottery tickets although the expected value is less than the money they pay to buy it. Or people gamble at casinos with the full knowledge that the expected return is negative, a characteristic of risk seekers. These or any other isolated actions, however, cannot be taken at face value except for compulsive gamblers.

Risk Neutral

If an investor is indifferent about the gamble or the guaranteed outcome, then the investor may be risk neutral. Risk neutrality means that the investor cares only about return and not about risk, so higher return investments are more desirable even if they come with higher risk. Many investors may exhibit characteristics of risk neutrality when the investment at stake is an insignificant part of their wealth. For example, a billionaire may be indifferent about choosing the gamble or a £50 guaranteed outcome.

Risk Averse

If an investor chooses the guaranteed outcome, he/she is said to be **risk averse** because the investor does not want to take the chance of not getting anything at all. Depending on the level of aversion to risk, an investor may be willing to accept a guaranteed outcome of £45 instead of a gamble with an expected value of £50.

In general, investors are likely to shy away from risky investments for a lower, but guaranteed return. That is why they want to minimize their risk for the same amount of return, and maximize their return for the same amount of risk. The risk–return trade-off discussed earlier is an indicator of risk aversion. A risk-neutral investor would maximize return irrespective of risk and a risk-seeking investor would maximize both risk and return.

Data presented in the last section illustrate the historically positive relationship between risk and return, which demonstrates that market prices were based on transactions and investments by risk-averse investors and reflect risk aversion. Therefore, for all practical purposes and for our future discussion, we will assume that the representative investor is a risk-averse investor. This assumption is the standard approach taken in the investment industry globally.

Risk Tolerance

Risk tolerance refers to the amount of risk an investor can tolerate to achieve an investment goal. The higher the risk tolerance, the greater is the willingness to take risk. Thus, risk tolerance is negatively related to risk aversion.

UTILITY THEORY AND INDIFFERENCE CURVES
5

explain risk aversion and its implications for portfolio selection

Continuing with our previous example, a risk-averse investor would rank the guaranteed outcome of £50 higher than the uncertain outcome with an expected value of £50. We can say that the utility that an investor or an individual derives from the guaranteed outcome of £50 is greater than the utility or satisfaction or happiness he/she derives from the alternative. In general terms, utility is a measure of relative satisfaction from consumption of various goods and services or in the case of investments, the satisfaction that an investor derives from a portfolio.

Because individuals are different in their preferences, all risk-averse individuals may not rank investment alternatives in the same manner. Consider the £50 gamble again. All risk-averse individuals will rank the guaranteed outcome of £50 higher than the gamble. What if the guaranteed outcome is only £40? Some risk-averse investors might consider £40 inadequate, others might accept it, and still others may now be indifferent about the uncertain £50 and the certain £40.

A simple implementation of utility theory allows us to quantify the rankings of investment choices using risk and return. There are several assumptions about individual behavior that we make in the definition of utility given in the equation below. We assume that investors are risk averse. They always prefer more to less (greater return to lesser return). They are able to rank different portfolios in the order of their preference and that the rankings are internally consistent. If an individual prefers X to Y and Y to Z, then he/she must prefer X to Z. This property implies that the indifference curves (see Exhibit 7) for the same individual can never touch or intersect. An example of a utility function is given below

$$U = E(r) - \frac{1}{2}A\sigma^2$$

where, U is the utility of an investment, $E(r)$ is the expected return, and σ^2 is the variance of the investment.

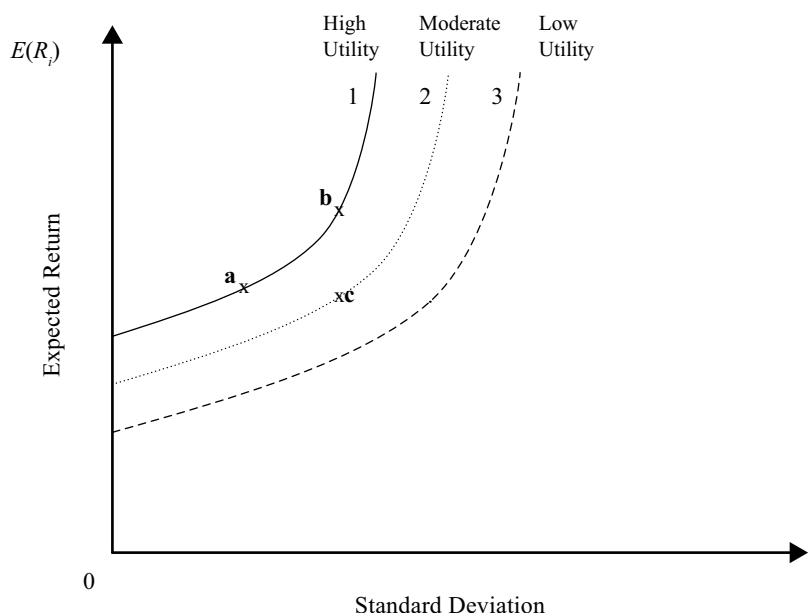
In the above equation, A is a measure of risk aversion, which is measured as the marginal reward that an investor requires to accept additional risk. More risk-averse investors require greater compensation for accepting additional risk. Thus, A is higher for more risk-averse individuals. As was mentioned previously, a risk-neutral investor would maximize return irrespective of risk and a risk-seeking investor would maximize both risk and return.

We can draw several conclusions from the utility function. First, utility is unbounded on both sides. It can be highly positive or highly negative. Second, higher return contributes to higher utility. Third, higher variance reduces the utility but the reduction in utility gets amplified by the risk aversion coefficient, A . Utility can always be increased, albeit marginally, by getting higher return or lower risk. Fourth, utility does not indicate or measure satisfaction itself—it can be useful only in ranking various investments. For example, a portfolio with a utility of 4 is not necessarily two times better than a portfolio with a utility of 2. The portfolio with a utility of 4 could increase our happiness 10 times or just marginally. But we do prefer a portfolio with a utility of 4 to a portfolio with a utility of 2. Utility cannot be compared among individuals or investors because it is a very personal concept. From a societal point of view, by the same argument, utility cannot be summed among individuals.

Let us explore the utility function further. The risk aversion coefficient, A , is greater than zero for a risk-averse investor. So any increase in risk reduces his/her utility. The risk aversion coefficient for a risk-neutral investor is 0, and changes in risk do not affect his/her utility. For a risk lover, the risk aversion coefficient is negative, creating an inverse situation so that additional risk contributes to an increase in his/her utility. Note that a risk-free asset ($\sigma^2 = 0$) generates the same utility for all individuals.

Indifference Curves

An **indifference curve** plots the combinations of risk–return pairs that an investor would accept to maintain a given level of utility (i.e., the investor is indifferent about the combinations on any one curve because they would provide the same level of overall utility). Indifference curves are thus defined in terms of a trade-off between expected rate of return and variance of the rate of return. Because an infinite number of combinations of risk and return can generate the same utility for the same investor, indifference curves are continuous at all points.

Exhibit 7: Indifference Curves for Risk-Averse Investors

A set of indifference curves is plotted in Exhibit 7. By definition, all points on any one of the three curves have the same utility. An investor does not care whether he/she is at Point **a** or Point **b** on indifference Curve 1. Point **a** has lower risk and lower return than Point **b**, but the utility of both points is the same because the higher return at Point **b** is offset by the higher risk.

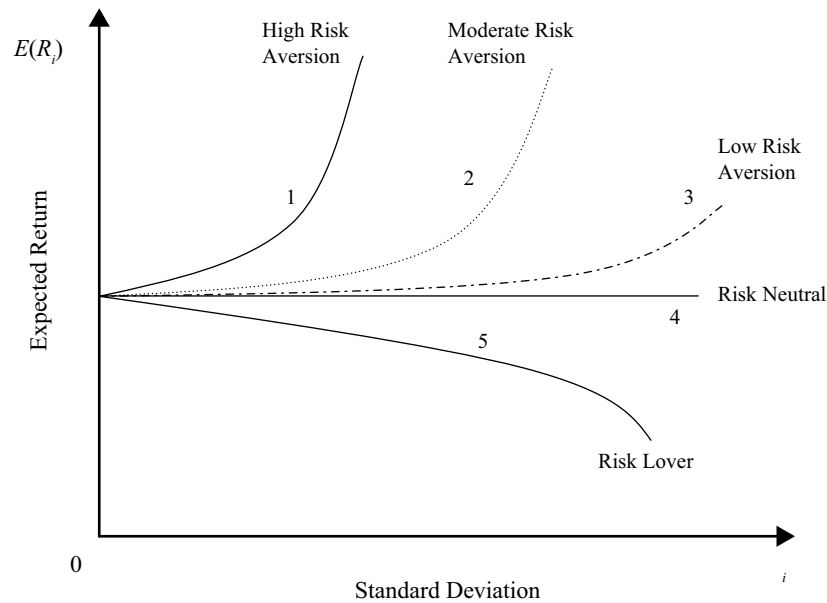
Like Curve 1, all points on Curve 2 have the same utility and an investor is indifferent about where he/she is on Curve 2. Now compare Point **c** with Point **b**. Point **c** has the same risk but significantly lower return than Point **b**, which means that the utility at Point **c** is less than the utility at Point **b**. Given that all points on Curve 1 have the same utility and all points on Curve 2 have the same utility and Point **b** has higher utility than Point **c**, Curve 1 has higher utility than Curve 2. Therefore, a risk-averse investor with indifference Curves 1 and 2 will prefer Curve 1 to Curve 2. The utility of a risk-averse investor always increases as you move northwest—higher return with lower risk. Because all investors prefer more utility to less, investors want to move northwest to the indifference curve with the highest utility.

The indifference curve for risk-averse investors runs from the southwest to the northeast because of the risk–return trade-off. If risk increases (going east) then it must be compensated by higher return (going north) to generate the same utility. The indifference curves are convex because of diminishing marginal utility of return (or wealth). As risk increases, an investor needs greater return to compensate for higher risk at an increasing rate (i.e., the curve gets steeper). The upward-sloping convex indifference curve has a slope coefficient closely related to the risk aversion coefficient. The greater the slope, the higher is the risk aversion of the investor as a greater increment in return is required to accept a given increase in risk.

Indifference curves for investors with different levels of risk aversion are plotted in Exhibit 8. The most risk-averse investor has an indifference curve with the greatest slope. As volatility increases, this investor demands increasingly higher returns to compensate for risk. The least risk-averse investor has an indifference curve with the least slope and so the demand for higher return as risk increases is not as acute as for the more risk-averse investor. The risk-loving investor's indifference curve, however, exhibits a negative slope, implying that the risk-lover is happy to substitute risk for

return. For a risk lover, the utility increases both with higher risk and higher return. Finally, the indifference curves of risk-neutral investors are horizontal because the utility is invariant with risk.

Exhibit 8: Indifference Curves for Various Types of Investors



In the remaining parts of this reading, all investors are assumed to be risk averse unless stated otherwise.

EXAMPLE 1

Comparing a Gamble with a Guaranteed Outcome

Assume that you are given an investment with an expected return of 10 percent and a risk (standard deviation) of 20 percent, and your risk aversion coefficient is 3.

1. What is your utility of this investment?

Solution

$$U = 0.10 - 0.5 \times 3 \times 0.20^2 = 0.04.$$

2. What must be the minimum risk-free return you should earn to get the same utility?

Solution

A risk-free return's σ is zero, so the second term disappears. To get the same utility (0.04), the risk-free return must be at least 4 percent. Thus, in your mind, a risky return of 10 percent is equivalent to a risk-free return or a guaranteed outcome of 4 percent.

EXAMPLE 2**Computation of Utility**

Based on investment information given below and the utility formula $U = E(r) - 0.5A\sigma^2$, answer the following questions. Returns and standard deviations are both expressed as percent per year. When using the utility formula, however, returns and standard deviations must be expressed in decimals.

Investment	Expected Return $E(r)$	Standard Deviation σ
1	12%	30%
2	15	35
3	21	40
4	24	45

1. Which investment will a risk-averse investor with a risk aversion coefficient of 4 choose, and which investment will a risk-averse investor with a risk aversion coefficient of 2 choose?

Solution

The utility for risk-averse investors with $A = 4$ and $A = 2$ for each of the four investments are shown in the following table. Complete calculations for Investment 1 with $A = 4$ are as follows: $U = 0.12 - 0.5 \times 4 \times 0.30^2 = -0.06$.

Investment	Expected Return $E(r)$	Standard Deviation σ	Utility $A = 4$	Utility $A = 2$
1	12%	30%	-0.0600	0.0300
2	15	35	-0.0950	0.0275
3	21	40	-0.1100	0.0500
4	24	45	-0.1650	0.0375

The risk-averse investor with a risk aversion coefficient of 4 should choose Investment 1. The risk-averse investor with a risk aversion coefficient of 2 should choose Investment 3.

2. Which investment will a risk-neutral investor choose?

Solution

A risk-neutral investor cares only about return. In other words, his risk aversion coefficient is 0. Therefore, a risk-neutral investor will choose Investment 4 because it has the highest return.

3. Which investment will a risk-loving investor choose?

Solution

A risk-loving investor likes both higher risk and higher return. In other words, his risk aversion coefficient is negative. Therefore, a risk-loving investor will choose Investment 4 because it has the highest return and highest risk among the four investments.

6

APPLICATION OF UTILITY THEORY TO PORTFOLIO SELECTION

- ☐ explain risk aversion and its implications for portfolio selection
- ☐ explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line

The simplest application of utility theory and risk aversion is to a portfolio of two assets, a risk-free asset and a risky asset. The risk-free asset has zero risk and a return of R_f . The risky asset has a risk of σ_i (> 0) and an expected return of $E(R_i)$. Because the risky asset has risk that is greater than that of the risk-free asset, the expected return from the risky asset will be greater than the return from the risk-free asset, that is, $E(R_i) > R_f$.

We can construct a portfolio of these two assets with a portfolio expected return, $E(R_p)$, and portfolio risk, σ_p , based on the formulas provided below. In the equations given below, w_1 is the weight in the risk-free asset and $(1 - w_1)$ is the weight in the risky asset. Because $\sigma_f = 0$ for the risk-free asset, the first and third terms in the formula for variance are zero leaving only the second term. We arrive at the last equation by taking the square root of both sides, which shows the expression for standard deviation for a portfolio of two assets when one asset is the risk-free asset:

$$\begin{aligned} E(R_p) &= w_1 R_f + (1 - w_1) E(R_i) \\ \sigma_p^2 &= w_1^2 \sigma_f^2 + (1 - w_1)^2 \sigma_i^2 + 2 w_1 (1 - w_1) \rho_{12} \sigma_f \sigma_i = (1 - w_1)^2 \sigma_i^2 \\ \sigma_p &= (1 - w_1) \sigma_i \end{aligned}$$

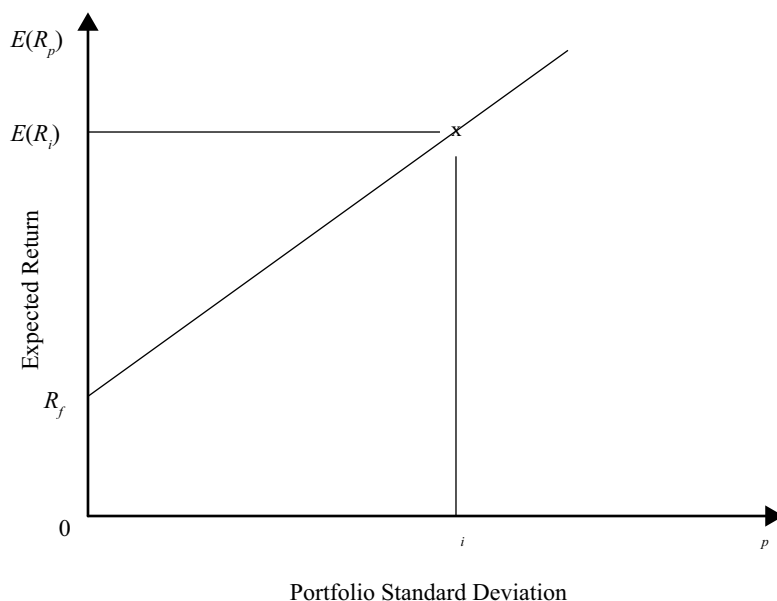
The two-asset portfolio is drawn in Exhibit 9 by varying w_1 from 0 percent to 100 percent. The portfolio standard deviation is on the horizontal axis and the portfolio return is on the vertical axis. If only these two assets are available in the economy and the risky asset represents the market, the line in Exhibit 9 is called the **capital allocation line**. The capital allocation line represents the portfolios available to an investor. The equation for this line can be derived from the above two equations by rewriting the second equation as $w_1 = 1 - \frac{\sigma_p}{\sigma_i}$. Substituting the value of w_1 in the equation for expected return, we get the following equation for the capital allocation line:

$$E(R_p) = \left(1 - \frac{\sigma_p}{\sigma_i}\right) R_f + \frac{\sigma_p}{\sigma_i} E(R_i)$$

This equation can be rewritten in a more usable form:

$$E(R_p) = R_f + \frac{(E(R_i) - R_f)}{\sigma_i} \sigma_p$$

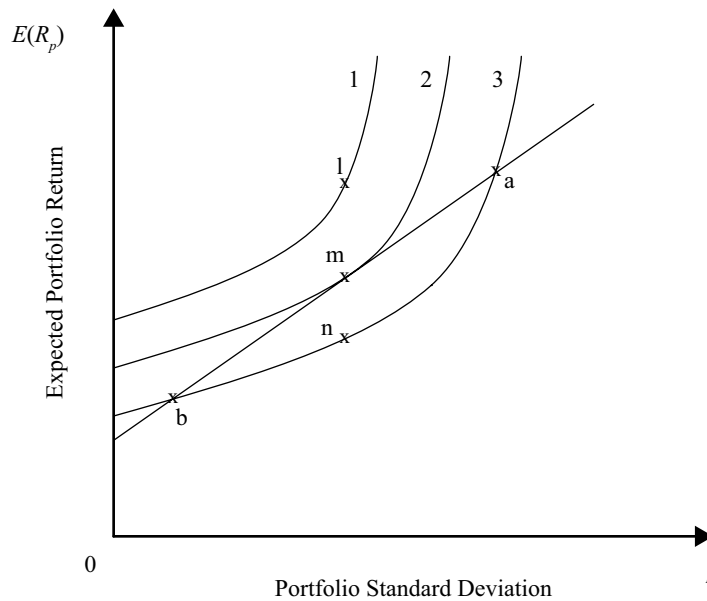
The capital allocation line has an intercept of R_f and a slope of $\frac{(E(R_i) - R_f)}{\sigma_i}$, which is the additional required return for every increment in risk, and is sometimes referred to as the market price of risk.

Exhibit 9: Capital Allocation Line with Two Assets

Because the equation is linear, the plot of the capital allocation line is a straight line. The line begins with the risk-free asset as the leftmost point with zero risk and a risk-free return, R_f . At that point, the portfolio consists of only the risk-free asset. If 100 percent is invested in the portfolio of all risky assets, however, we have a return of $E(R_i)$ with a risk of σ_i .

We can move further along the line in pursuit of higher returns by borrowing at the risk-free rate and investing the borrowed money in the portfolio of all risky assets. If 50 percent is borrowed at the risk-free rate, then $w_f = -0.50$ and 150 percent is placed in the risky asset, giving a return $= 1.50E(R_i) - 0.50R_f$, which is $> E(R_i)$ because $E(R_i) > R_f$.

The line plotted in Exhibit 9 is comprised of an unlimited number of risk–return pairs or portfolios. Which *one* of these portfolios should be chosen by an investor? The answer lies in combining indifference curves from utility theory with the capital allocation line from portfolio theory. Utility theory gives us the utility function or the indifference curves for an individual, as in Exhibit 13, and the capital allocation line gives us the set of feasible investments. Overlaying each individual's indifference curves on the capital allocation line will provide us with the optimal portfolio for that investor. Exhibit 10 illustrates this process of portfolio selection.

Exhibit 10: Portfolio Selection

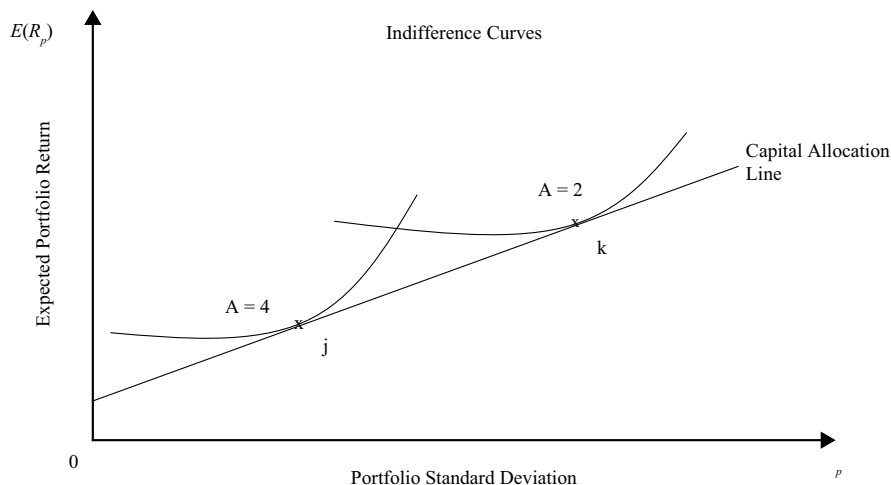
The capital allocation line consists of the set of feasible portfolios. Points under the capital allocation line may be attainable but are not preferred by any investor because the investor can get a higher return for the same risk by moving up to the capital allocation line. Points above the capital allocation line are desirable but not achievable with available assets.

Three indifference curves for the same individual are also shown in Exhibit 10. Curve 1 is above the capital allocation line, Curve 2 is tangential to the line, and Curve 3 intersects the line at two points. Curve 1 has the highest utility and Curve 3 has the lowest utility. Because Curve 1 lies completely above the capital allocation line, points on Curve 1 are not achievable with the available assets on the capital allocation line. Curve 3 intersects the capital allocation line at two Points, **a** and **b**. The investor is able to invest at either Point **a** or **b** to derive the risk–return trade-off and utility associated with Curve 3. Comparing points with the same risk, observe that Point **n** on Curve 3 has the same risk as Point **m** on Curve 2, yet Point **m** has the higher expected return. Therefore, all investors will choose Curve 2 instead of Curve 3. Curve 2 is tangential to the capital allocation line at Point **m**. Point **m** is on the capital allocation line and investable. Point **m** and the utility associated with Curve 2 is the best that the investor can do because he/she cannot move to a higher utility indifference curve. Thus, we have been able to select the optimal portfolio for the investor with indifference Curves 1, 2, and 3. Point **m**, the optimal portfolio for one investor, may not be optimal for another investor. We can follow the same process, however, for finding the optimal portfolio for other investors: the optimal portfolio is the point of tangency between the capital allocation line and the indifference curve for that investor. In other words, the optimal portfolio maximizes the return per unit of risk (as it is on the capital allocation line), and it simultaneously supplies the investor with the most satisfaction (utility).

As an illustration, Exhibit 11 shows two indifference curves for two different investors: Kelly with a risk aversion coefficient of 2 and Jane with a risk aversion coefficient of 4. The indifference curve for Kelly is to the right of the indifference curve for Jane because Kelly is less risk averse than Jane and can accept a higher amount of risk, i.e. has a higher tolerance for risk. Accordingly, their optimal portfolios are different:

Point **k** is the optimal portfolio for Kelly and Point **j** is the optimal portfolio for Jane. In addition, for the same return, the slope of Jane's curve is higher than Kelly's suggesting that Jane needs greater incremental return as compensation for accepting an additional amount of risk compared with Kelly.

Exhibit 11: Portfolio Selection for Two Investors with Various Levels of Risk Aversion



PORTFOLIO RISK & PORTFOLIO OF TWO RISKY ASSETS

7

- ☐ calculate and interpret the mean, variance, and covariance (or correlation) of asset returns based on historical data
- ☐ calculate and interpret portfolio standard deviation
- ☐ describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated

We have seen before that investors are risk averse and demand a higher return for a riskier investment. Therefore, ways of controlling portfolio risk without affecting return are valuable. As a precursor to managing risk, this section explains and analyzes the components of portfolio risk. In particular, it examines and describes how a portfolio consisting of assets with low correlations have the potential of reducing risk without necessarily reducing return.

Portfolio of Two Risky Assets

The return and risk of a portfolio of two assets was introduced in Sections 2–8 of this reading. In this section, we briefly review the computation of return and extend the concept of portfolio risk and its components.

Portfolio Return

When several individual assets are combined into a portfolio, we can compute the portfolio return as a weighted average of the returns in the portfolio. The portfolio return is simply a weighted average of the returns of the individual investments, or assets. If Asset 1 has a return of 20 percent and constitutes 25 percent of the portfolio's investment, then the contribution to the portfolio return is 5 percent (= 25% of 20%). In general, if Asset i has a return of R_i and has a weight of w_i in the portfolio, then the portfolio return, R_p , is given as:

$$R_p = \sum_{i=1}^N w_i R_i, \quad \sum_{i=1}^N w_i = 1$$

Note that the weights must add up to 1 because the assets in a portfolio, including cash, must account for 100 percent of the investment. Also, note that these are single period returns, so there are no cash flows during the period and the weights remain constant.

When two individual assets are combined in a portfolio, we can compute the portfolio return as a weighted average of the returns of the two assets. Consider Assets 1 and 2 with weights of 25 percent and 75 percent in a portfolio. If their returns are 20 percent and 5 percent, the weighted average return = $(0.25 \times 20\%) + (0.75 \times 5\%) = 8.75\%$. More generally, the portfolio return can be written as below, where R_p is return of the portfolio, w_1 and w_2 are the weights of the two assets, and R_1 , R_2 are returns on the two assets:

$$R_p = w_1 R_1 + (1 - w_1) R_2$$

Portfolio Risk

Like a portfolio's return, we can calculate a portfolio's variance. Although the return of a portfolio is simply a weighted average of the returns of each security, this is not the case with the standard deviation of a portfolio (unless all securities are perfectly correlated—that is, correlation equals one). Variance can be expressed more generally for N securities in a portfolio using the notation from the portfolio return calculation above:

$$\sum_{i=1}^N w_i = 1$$

$$\sigma_p^2 = \text{Var}(R_p) = \text{Var}\left(\sum_{i=1}^N w_i R_i\right)$$

Note that the weights must add up to 1. The right side of the equation is the variance of the weighted average returns of individual securities. Weight is a constant, but the returns are variables whose variance is shown by $\text{Var}(R_i)$. We can rewrite the equation as shown next. Because the covariance of an asset with itself is the variance of the asset, we can separate the variances from the covariances in the second equation:

$$\sigma_p^2 = \sum_{i,j=1}^N w_i w_j \text{Cov}(R_i, R_j)$$

$$\sigma_p^2 = \sum_{i=1}^N w_i^2 \text{Var}(R_i) + \sum_{i,j=1, i \neq j}^N w_i w_j \text{Cov}(R_i, R_j)$$

$\text{Cov}(R_i, R_j)$ is the covariance of returns, R_i and R_j , and can be expressed as the product of the correlation between the two returns ($\rho_{1,2}$) and the standard deviations of the two assets. Thus, $\text{Cov}(R_i, R_j) = \rho_{ij} \sigma_i \sigma_j$.

For a two asset portfolio, the expression for portfolio variance simplifies to the following using covariance and then using correlation:

$$\sigma_P^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \text{Cov}(R_1, R_2)$$

$$\sigma_P^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2$$

The standard deviation of a two asset portfolio is given by the square root of the portfolio's variance:

$$\sigma_P = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \text{Cov}(R_1, R_2)}$$

or,

$$\sigma_P = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2}$$

EXAMPLE 3

Return and Risk of a Two-Asset Portfolio

1. Assume that as a US investor, you decide to hold a portfolio with 80 percent invested in the S&P 500 US stock index and the remaining 20 percent in the MSCI Emerging Markets index. The expected return is 9.93 percent for the S&P 500 and 18.20 percent for the Emerging Markets index. The risk (standard deviation) is 16.21 percent for the S&P 500 and 33.11 percent for the Emerging Markets index. What will be the portfolio's expected return and risk given that the covariance between the S&P 500 and the Emerging Markets index is 0.5 percent or 0.0050? Note that units for covariance and variance are written as %² when not expressed as a fraction. These are units of measure like squared feet and the numbers themselves are not actually squared.

Solution:

$$\begin{aligned} \text{Portfolio return, } R_P &= w_1 R_1 + (1 - w_1) R_2 = (0.80 \times 0.0993) + (0.20 \times 0.1820) \\ &= 0.1158 \\ &= 11.58\%. \end{aligned}$$

$$\text{Portfolio risk} = \sigma_P = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \text{Cov}(R_1, R_2)}$$

$$\sigma_P^2 = w_{US}^2 \sigma_{US}^2 + w_{EM}^2 \sigma_{EM}^2 + 2 w_{US} w_{EM} \text{Cov}_{US,EM}$$

$$\sigma_P^2 = (0.80^2 \times 0.1621^2) + (0.20^2 \times 0.3311^2)$$

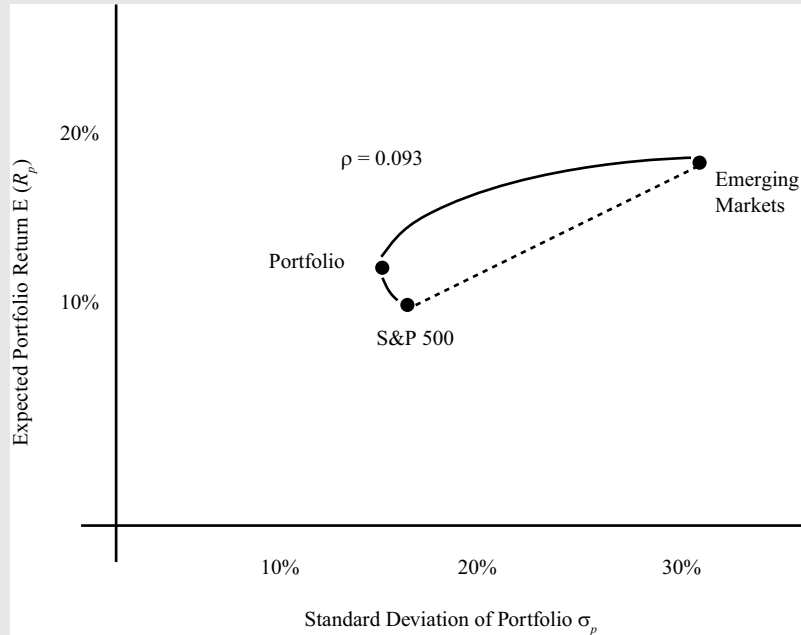
$$+ (2 \times 0.80 \times 0.20 \times 0.0050)$$

$$\sigma_P^2 = 0.01682 + 0.00439 + 0.00160 = 0.02281$$

$$\sigma_P = 0.15103 = 15.10\%$$

The portfolio's expected return is 11.58 percent and the portfolio's risk is 15.10 percent. Look at this example closely. It shows that we can take the portfolio of a US investor invested only in the S&P 500, combine it with a *riskier* portfolio consisting of emerging markets securities, and the return of the US investor increases from 9.93 percent to 11.58 percent while the risk of the portfolio actually falls from 16.21 percent to 15.10 percent. Exhibit 12 depicts how the combination of the two assets results in a superior risk–return trade-off. Not only does the investor get a higher return, but he also gets it at a lower risk. That is the power of diversification as you will see later in this reading.

Exhibit 12: Combination of Two Assets



Covariance and Correlation

The **covariance** in the formula for portfolio standard deviation can be expanded as $\text{Cov}(R_1, R_2) = \rho_{12}\sigma_1\sigma_2$ where ρ_{12} is the correlation between returns, R_1, R_2 . Although covariance is important, it is difficult to interpret because it is unbounded on both sides. It is easier to understand the **correlation coefficient** (ρ_{12}), which is bounded but provides similar information.

Correlation is a measure of the consistency or tendency for two investments to act in a similar way. The correlation coefficient, ρ_{12} , can be positive or negative and ranges from -1 to $+1$. Consider three different values of the correlation coefficient:

- $\rho_{12} = +1$: Returns of the two assets are perfectly *positively* correlated. Assets 1 and 2 move together 100 percent of the time.
- $\rho_{12} = -1$: Returns of the two assets are perfectly *negatively* correlated. Assets 1 and 2 move in opposite directions 100 percent of the time.
- $\rho_{12} = 0$: Returns of the two assets are *uncorrelated*. Movement of Asset 1 provides no prediction regarding the movement of Asset 2.

The correlation coefficient between two assets determines the effect on portfolio risk when the two assets are combined. To see how this works, consider two different values of ρ_{12} . You will find that portfolio risk is unaffected when the two assets are perfectly correlated ($\rho_{12} = +1$). In other words, the portfolio's standard deviation is simply a weighted average of the standard deviations of the two assets and as such a portfolio's risk is unchanged with the addition of assets with the same risk parameters. Portfolio risk falls, however, when the two assets are not perfectly correlated ($\rho_{12} < +1$). Sufficiently low values of the correlation coefficient can make the portfolio riskless under certain conditions.

First, let $\rho_{12} = +1$

$$\begin{aligned}\sigma_p^2 &= w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \\ &= (w_1 \sigma_1 + w_2 \sigma_2)^2 \\ \sigma_p &= w_1 \sigma_1 + w_2 \sigma_2\end{aligned}$$

The first set of terms on the right side of the first equation contain the usual terms for portfolio variance. Because the correlation coefficient is equal to +1, the right side can be rewritten as a perfect square. The third row shows that portfolio risk is a weighted average of the risks of the individual assets' risks. We showed earlier that the portfolio return is a weighted average of the assets' returns. Because both risk and return are just weighted averages of the two assets in the portfolio there is no reduction in risk when $\rho_{12} = +1$.

Now let $\rho_{12} < +1$

The above analysis showed that portfolio risk is a weighted average of asset risks when $\rho_{12} = +1$. When $\rho_{12} < +1$, the portfolio risk is less than the weighted average of the individual assets' risks.

To show this, we begin by reproducing the general formula for portfolio risk, which is expressed by the terms to the left of the "<" sign below. The term to the right of "<" shows the portfolio risk when $\rho_{12} = +1$:

$$\begin{aligned}\sigma_p &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2} < \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2} \\ &= (w_1 \sigma_1 + w_2 \sigma_2) \\ \sigma_p &< (w_1 \sigma_1 + w_2 \sigma_2)\end{aligned}$$

The left side is smaller than the right side because the correlation coefficient on the left side for the new portfolio is <1 . Thus, the portfolio risk is less than the weighted average of risks while the portfolio return is still a weighted average of returns.

As you can see, we have achieved diversification by combining two assets that are not perfectly correlated. For an extreme case in which $\rho_{12} = -1$ (that is, the two asset returns move in opposite directions), the portfolio can be made risk free.

EXAMPLE 4

Effect of Correlation on Portfolio Risk

Two stocks have the same return and risk (standard deviation): 10 percent return with 20 percent risk. You form a portfolio with 50 percent each of Stock 1 and Stock 2 to examine the effect of correlation on risk.

1. Calculate the portfolio return and risk if the correlation is 1.0.

Solution

$$\begin{aligned}R_1 &= R_2 = 10\% = 0.10; \sigma_1 = \sigma_2 = 20\% = 0.20; w_1 = w_2 = 50\% \\ &= 0.50. \text{ Case 1: } \rho_{12} = +1 \\ R_p &= w_1 R_1 + w_2 R_2 \\ R_p &= (0.5 \times 0.1) + (0.5 \times 0.1) = 0.10 = 10\% \\ \sigma_p^2 &= w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{12} \\ \sigma_p^2 &= (0.5^2 \times 0.2^2) + (0.5^2 \times 0.2^2) + (2 \times 0.5 \times 0.5 \times 0.2 \times 0.2 \times 1) = 0.04 \\ \sigma_p &= \sqrt{0.04} = 0.20 = 20\%\end{aligned}$$

This equation demonstrates the earlier point that with a correlation of 1.0 the risk of the portfolio is the same as the risk of the individual assets.

2. Calculate the portfolio return and risk if the correlation is 0.0.

Solution

$$\begin{aligned}\rho_{12} &= 0 \\ R_p &= w_1 R_1 + w_2 R_2 = 0.10 = 10\% \\ \sigma_p^2 &= w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{12} \\ \sigma_p^2 &= (0.5^2 \times 0.2^2) + (0.5^2 \times 0.2^2) \\ &\quad + (2 \times 0.5 \times 0.5 \times 0.2 \times 0.2 \times 0) = 0.02 \\ \sigma_p &= \sqrt{0.02} = 0.14 = 14\%\end{aligned}$$

This equation demonstrates the earlier point that, when assets have correlations of less than 1.0, they can be combined in a portfolio that has less risk than either of the assets individually.

3. Calculate the portfolio return and risk if the correlation is -1.0 .

Solution

$$\begin{aligned}\rho_{12} &= -1 \\ R_p &= w_1 R_1 + w_2 R_2 = 0.10 = 10\% \\ \sigma_p^2 &= w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho_{12} \\ \sigma_p^2 &= (0.5^2 \times 0.2^2) + (0.5^2 \times 0.2^2) \\ &\quad + (2 \times 0.5 \times 0.5 \times 0.2 \times 0.2 \times -1) = 0 \\ \sigma_p &= 0\%\end{aligned}$$

This equation demonstrates the earlier point that, if the correlation of assets is low enough, in this case 100 percent negative correlation or -1.00 (exactly inversely related), a portfolio can be designed that eliminates risk. The individual assets retain their risk characteristics, but the portfolio is risk free.

4. Compare the return and risk of portfolios with different correlations.

Solution

The expected return is 10 percent in all three cases; however, the returns will be more volatile in Case 1 and least volatile in Case 3. In the first case, there is no diversification of risk (same risk as before of 20 percent) and the return remains the same. In the second case, with a correlation coefficient of 0, we have achieved diversification of risk (risk is now 14 percent instead of 20 percent), again with the same return. In the third case with a correlation coefficient of -1 , the portfolio is risk free, although we continue to get the same return of 10 percent. This example shows the power of diversification that we expand on further in Section 14.

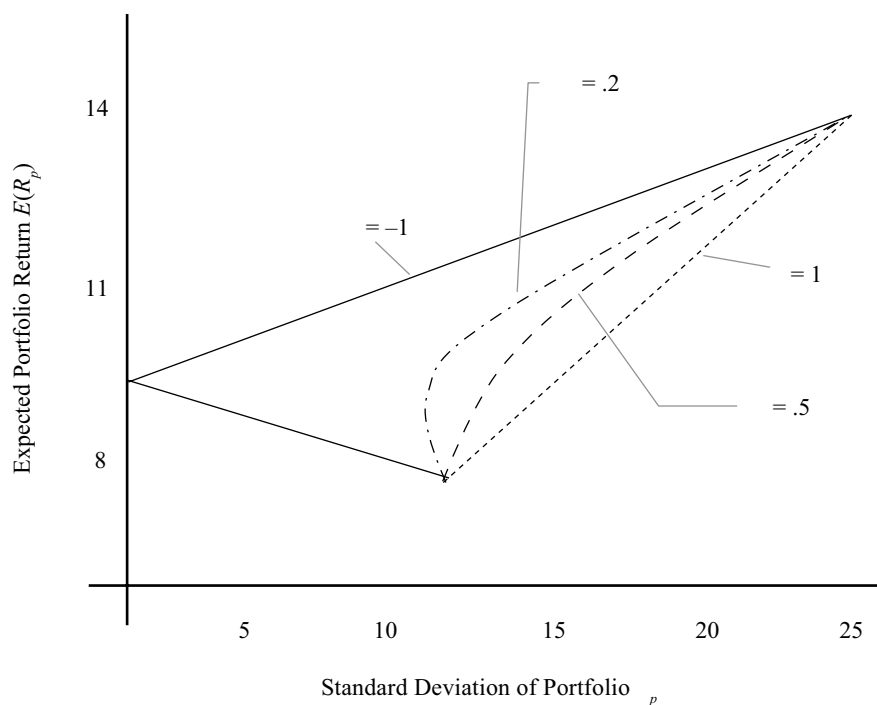
Relationship between Portfolio Risk and Return

The previous example illustrated the effect of correlation on portfolio risk while keeping the weights in the two assets equal and unchanged. In this section, we consider how portfolio risk and return vary with different portfolio weights and different correlations.

Asset 1 has an annual return of 7 percent and annualized risk of 12 percent, whereas Asset 2 has an annual return of 15 percent and annualized risk of 25 percent. The relationship is tabulated in Exhibit 13 for the two assets and graphically represented in Exhibit 14.

Exhibit 13: Relationship between Risk and Return

Weight in Asset 1 (%)	Portfolio Return	Portfolio Risk with Correlation of			
		1.0	0.5	0.2	-1.0
0	15.0	25.0	25.0	25.0	25.0
10	14.2	23.7	23.1	22.8	21.3
20	13.4	22.4	21.3	20.6	17.6
30	12.6	21.1	19.6	18.6	13.9
40	11.8	19.8	17.9	16.6	10.2
50	11.0	18.5	16.3	14.9	6.5
60	10.2	17.2	15.0	13.4	2.8
70	9.4	15.9	13.8	12.3	0.9
80	8.6	14.6	12.9	11.7	4.6
90	7.8	13.3	12.2	11.6	8.3
100	7.0	12.0	12.0	12.0	12.0

Exhibit 14: Relationship between Risk and Return

The table shows the portfolio return and risk for four correlation coefficients ranging from +1.0 to -1.0 and 11 weights ranging from 0 percent to 100 percent. The portfolio return and risk are 15 percent and 25 percent, respectively, when 0 percent is invested in Asset 1, versus 7 percent and 12 percent when 100 percent is invested in Asset 1. The portfolio return varies with weights but is unaffected by the correlation coefficient.



Portfolio risk becomes smaller with each successive decrease in the correlation coefficient, with the smallest risk when $\rho_{12} = -1$. The graph in Exhibit 14 shows that the risk–return relationship is a straight line when $\rho_{12} = +1$. As the correlation falls, the risk becomes smaller and smaller as in the table. The curvilinear nature of a portfolio of assets is recognizable in all investment opportunity sets (except at the extremes where $\rho_{12} = -1$ or $+1$).

EXAMPLE 5

Portfolio of Two Assets

Assume you are a UK investor holding a portfolio invested 60% in UK large-capitalization equities (as proxied by the FTSE 100 Index) and 40% in local medium-duration Treasury bonds (“gilts”). The expected return on the FTSE 100 is 5.5% and on the medium-duration gilts it is 0.7%. The risk (standard deviation of returns) is 13.2% and 4.2%, respectively. The correlation between the two assets is -0.01 .

The expected return of this portfolio is

$$R_p = w_1 \times R_1 + (1 - w_1) \times R_2 = 0.6 \times 0.055 + 0.4 \times 0.07 = 0.0358 \approx 3.6\%.$$

The risk of this portfolio is

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 \times w_1 w_2 \times \rho \times \sigma_1 \sigma_2}.$$

$$\sigma_p = \sqrt{(0.6^2 \times 0.132^2) + (0.4^2 \times 0.042^2) + 2 \times 0.6 \times 0.4 \times -0.01 \times 0.132 \times 0.042}.$$

$$\sigma_p = 0.0808 \approx 8.1\%$$

You notice that compared with US Treasury bonds, the expected return on gilts is lower and the risk of gilts is higher. US Treasury bonds have an expected return for a US-based investor of 1.5% and a risk of 4.0%. You wonder whether replacing the gilts in your portfolio with US Treasury bonds (“Treasuries”) would improve the risk and return profile of your portfolio.

1. Do the given risk and return assumptions for US Treasury bonds allow you as a UK-based investor to calculate the expected return and risk of your portfolio with US Treasury bonds replacing UK gilts?

Solution:

No. The expected return and risk for Treasuries apply to a US investor, who invests in US dollars. To calculate expected return and risk in sterling for a UK-based portfolio of FTSE 100 equities and US Treasuries, one needs to take into account the exchange rate between the US dollar and UK pound sterling. This exchange rate has a volatility (risk) of its own, and a return expectation for the GBP/USD exchange rate has to be specified.

For the purpose of calculating the return and risk of a foreign asset in a domestic investor’s portfolio, the foreign asset can be seen as a “portfolio” of two assets. The return of a foreign asset in domestic (i.e., non-foreign) currency can be decomposed into a local currency return component and an exchange rate component:

$$R_D = (1 + R_{lc}) \times (1 + R_{FX}) - 1$$

Because the portfolio is fully exposed to the movement in both the asset’s value in local currency and the currency exchange rate, the foreign currency and the asset each have a 100% portfolio weight. Note that the exchange

rate must be specified as domestic currency/foreign currency to convert the foreign currency return into the investor's domestic currency. The risk can be calculated as follows:

$$\begin{aligned}\sigma_D &= \sqrt{w_1^2 \sigma_{lc}^2 + w_2^2 \sigma_{FX}^2 + 2 \times w_1 w_2 \times \rho \times \sigma_{lc} \sigma_{FX}} \\ &= \sqrt{\sigma_{lc}^2 + \sigma_{FX}^2 + 2 \times \rho \times \sigma_{lc} \times \sigma_{FX}}.\end{aligned}$$

Assume in what follows that the risk (measured as expected standard deviation) of the GBP/USD currency exchange rate is 9.0% and the returns on Treasuries have a correlation with the GBP/USD exchange rate of 0.33. Assume also that you have no forecast for the future value of the USD/GBP exchange rate, and hence assume a 0% return.

2. What would be the expected risk of US Treasuries to you as a UK investor?

Solution

$$\begin{aligned}\sigma_D &= \sqrt{\sigma_{lc}^2 + \sigma_{FX}^2 + 2 \times \rho \times \sigma_{lc} \times \sigma_{FX}} \\ &= \sqrt{0.040^2 + 0.090^2 + 2 \times 0.33 \times 0.040 \times 0.090}.\end{aligned}$$

$$\sigma_D = 0.110 = 11.0\%.$$

The correlations between the FTSE 100, US Treasuries, and the USD/GBP exchange rate are as depicted in the following correlation matrix.

	FTSE 100	US Treasuries	GBP/USD
FTSE 100	1.00	-0.32	-0.06
US Treasuries	-0.32	1.00	0.33
GBP/USD	-0.06	0.33	1.00

3. What would be the expected return and risk for your portfolio if you replace the UK gilts with US Treasuries?

Solution:

The expected return is the weighted average of the expected returns in British pound sterling (GBP) of UK large-capitalization equities and of US Treasuries. Recall that the return of a foreign asset in domestic currency consists of a foreign currency component and an asset component. All expected returns can be found above.

$$R_p = w_1 \times R_1 + (1 - w_1) \times [(1 + R_{lc}) \times (1 + R_{FX}) - 1].$$

$$R_p = 0.6 \times 0.055 + 0.4 \times [(1 + 0.015) \times (1 + 0.0) - 1] = 0.039 = 3.9\%.$$

Calculation of the risk of the portfolio involves a slightly more complicated formula. Recall that the risk of a two-asset portfolio depends on the risk and the weights of the individual assets and the co-movements between the two. For a three-asset portfolio (an equity portion, a foreign fixed-income portion, and the associated foreign currency exposure), the calculation is essentially the same, however there are three pairs of co-movements between assets, rather than one.

The formula for the standard deviation of a three-asset portfolio is therefore

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2\rho_{1,2} w_1 w_2 \sigma_1 \sigma_2 + 2\rho_{1,3} w_1 w_3 \sigma_1 \sigma_3 + 2\rho_{2,3} w_2 w_3 \sigma_2 \sigma_3}.$$

The portfolio weight of the foreign currency exposure is equal to the portfolio weight of the US Treasuries.

Using the information provided above, we can calculate the risk of the portfolio with UK large-capitalization equities and US Treasuries as follows:

$$\sigma_p = (0.6^2 \times 0.132^2 + 0.4^2 \times 0.040^2 + 0.4^2 \times 0.090^2 + 2 \times -0.32 \times 0.6 \times 0.4 \times 0.132 \times 0.040 + 2 \times -0.06 \times 0.6 \times 0.4 \times 0.132 \times 0.090 + 2 \times 0.33 \times 0.4 \times 0.4 \times 0.040 \times 0.090)^{1/2}.$$

$$\sigma_p = 0.0841 \approx 8.4\%.$$

Compared to the UK equity/gilt portfolio, the UK equity/US Treasury portfolio has a higher expected return, because the UK gilts were replaced with an asset with superior return expectations. The risk of the new portfolio, however, is slightly higher despite the lower risk in local currency terms of US Treasuries compared to gilts. Owning US Treasuries as a non-US investor means being exposed to exchange rate risk, which should be considered when evaluating the risk profile.

8

PORTFOLIO OF MANY RISKY ASSETS

- ☐ calculate and interpret portfolio standard deviation
- ☐ describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated

In the previous section, we discussed how the correlation between two assets can affect the risk of a portfolio and the smaller the correlation the lower is the risk. The above analysis can be extended to a portfolio with many risky assets (N). Recall the previous equations for portfolio return and variance:

$$E(R_p) = \sum_{i=1}^N w_i E(R_i), \quad \sigma_p^2 = \left(\sum_{i=1}^N w_i^2 \sigma_i^2 + \sum_{i,j=1, i \neq j}^N w_i w_j \text{Cov}(i,j) \right), \quad \sum_{i=1}^N w_i = 1$$

To examine how a portfolio with many risky assets works and the ways in which we can reduce the risk of a portfolio, assume that the portfolio has equal weights ($1/N$) for all N assets. In addition, assume that $\bar{\sigma}^2$ and $\overline{\text{Cov}}$ are the average variance and average covariance. Given equal weights and average variance/covariance, we can rewrite the portfolio variance as below (intermediate steps are omitted to focus on the main result):

$$\sigma_p^2 = \left(\sum_{i=1}^N w_i^2 \sigma_i^2 + \sum_{i,j=1, i \neq j}^N w_i w_j \text{Cov}(i,j) \right)$$

$$\sigma_p^2 = \frac{\bar{\sigma}^2}{N} + \frac{(N-1)}{N} \overline{\text{Cov}}$$

The equation in the second line shows that as N becomes large, the first term on the right side with the denominator of N becomes smaller and smaller, implying that the contribution of one asset's variance to portfolio variance gradually becomes negligible. The second term, however, approaches the average covariance as N increases. It is reasonable to say that for portfolios with a large number of assets, covariance among the assets accounts for almost all of the portfolio's risk.

Importance of Correlation in a Portfolio of Many Assets

The analysis becomes more instructive and interesting if we assume that all assets in the portfolio have the same variance and the same correlation among assets. In that case, the portfolio risk can then be rewritten as:

$$\sigma_p = \sqrt{\frac{\sigma^2}{N} + \frac{(N-1)}{N}\rho\sigma^2}$$

The first term under the root sign becomes negligible as the number of assets in the portfolio increases leaving the second term (correlation) as the main determining factor for portfolio risk. If the assets are unrelated to one another, the portfolio can have close to zero risk. In the next section, we review these concepts to learn how portfolios can be diversified.

THE POWER OF DIVERSIFICATION

9

- ☐ describe characteristics of the major asset classes that investors consider in forming portfolios
- ☐ describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated

Diversification is one of the most important and powerful concepts in investments. Because investors are risk averse, they are interested in reducing risk preferably without reducing return. In other cases, investors may accept a lower return if it will reduce the chance of catastrophic losses. In previous sections of this reading, you learned the importance of correlation and covariance in managing risk. This section applies those concepts to explore ways for risk diversification. We begin with a simple but intuitive example.

EXAMPLE 6

Diversification with Rain and Shine

Assume a company Beachwear rents beach equipment. The annual return from the company's operations is 20 percent in years with many sunny days but falls to 0 percent in rainy years with few sunny days. The probabilities of a sunny year and a rainy year are equal at 50 percent. Thus, the average return is 10 percent, with a 50 percent chance of 20 percent return and a 50 percent chance of 0 percent return. Because Beachwear can earn a return of 20 percent or 0 percent, its average return of 10 percent is risky.

You are excited about investing in Beachwear but do not like the risk. Having heard about diversification, you decide to add another business to the portfolio to reduce your investment risk.

- There is a snack shop on the beach that sells all the healthy food you like. You estimate that the annual return from the Snackshop is also 20 percent in years with many sunny days and 0 percent in other years. As with the Beachwear shop, the average return is 10 percent.

You decide to invest 50 percent each in Snackshop and Beachwear. The average return is still 10 percent, with 50 percent of 10 percent from Snackshop and 50 percent of 10 percent from Beachwear. In a sunny year, you would earn

20 percent (= 50% of 20% from Beachwear + 50% of 20% from Snackshop). In a rainy year, you would earn 0 percent (=50% of 0% from Beachwear + 50% of 0% from Snackshop). The results are tabulated in Exhibit 15.

Exhibit 15

Type	Company	Percent Invested	Return in Sunny Year (%)	Return in Rainy Year (%)	Average Return (%)
Single stock	Beachwear	100	20	0	10
Single stock	Snackshop	100	20	0	10
Portfolio of two stocks	Beachwear	50	20	0	10
	Snackshop	50	20	0	10
	Total	100	20	0	10

These results seem counterintuitive. You thought that by adding another business you would be able to diversify and reduce your risk, but the risk is exactly the same as before. What went wrong? Note that both businesses do well when it is sunny and both businesses do poorly when it rains. The correlation between the two businesses is +1.0. No reduction in risk occurs when the correlation is +1.0.

- To reduce risk, you must consider a business that does well in a rainy year. You find a company that rents DVDs. DVDrental company is similar to the Beachwear company, except that its annual return is 20 percent in a rainy year and 0 percent in a sunny year, with an average return of 10 percent. DVDrental's 10 percent return is also risky just like Beachwear's return.

If you invest 50 percent each in DVDrental and Beachwear, then the average return is still 10 percent, with 50 percent of 10 percent from DVDrental and 50 percent of 10 percent from Beachwear. In a sunny year, you would earn 10 percent (= 50% of 20% from Beachwear + 50% of 0% from DVDrental). In a rainy year also, you would earn 10 percent (=50% of 0% from Beachwear + 50% of 20% from DVDrental). You have no risk because you earn 10 percent in both sunny and rainy years. Thus, by adding DVDrental to Beachwear, you have reduced (eliminated) your risk without affecting your return. The results are tabulated in Exhibit 16.

Exhibit 16

Type	Company	Percent Invested	Return in Sunny Year (%)	Return in Rainy Year (%)	Average Return (%)
Single stock	Beachwear	100	20	0	10
Single stock	DVDrental	100	0	20	10

Type	Company	Percent Invested	Return in Sunny Year (%)	Return in Rainy Year (%)	Average Return (%)
Portfolio of two stocks	Beachwear	50	20	0	10
	DVDrental	50	0	20	10
	Total	100	10	10	10

In this case, the two businesses have a correlation of -1.0 . When two businesses with a correlation of -1.0 are combined, risk can always be reduced to zero.

Correlation and Risk Diversification

Correlation is the key in diversification of risk. Notice that the returns from Beachwear and DVDrental always go in the opposite direction. If one of them does well, the other does not. Therefore, adding assets that do not behave like other assets in your portfolio is good and can reduce risk. The two companies in the above example have a correlation of -1.0 .

Even when we expand the portfolio to many assets, correlation among assets remains the primary determinant of portfolio risk. Lower correlations are associated with lower risk. Unfortunately, most assets have high positive correlations. The challenge in diversifying risk is to find assets that have a correlation that is much lower than $+1.0$.

Historical Risk and Correlation

When we previously discussed asset returns, we were careful to distinguish between historical or past returns and expected or future returns because historical returns may not be a good indicator of future returns. Returns may be highly positive in one period and highly negative in another period depending on the risk of that asset. Exhibit 7 showed that returns for large US company stocks were high in the 1990s but were very low in the 2000s.

Risk for an asset class, however, does not usually change dramatically from one period to the next. Stocks have been risky even in periods of low returns. T-bills are always less risky even when they earn high returns. From Exhibit 7, we can see that risk has typically not varied much from one decade to the next, except that risk for bonds has been much higher in recent decades when compared with earlier decades. Therefore, it is not unreasonable to assume that historical risk can work as a good proxy for future risk.

As with risk, correlations are quite stable among assets of the same country. Inter-country correlations, however, have been on the rise in the last few decades as a result of globalization and the liberalization of many economies. A correlation above 0.90 is considered high because the assets do not provide much opportunity for diversification of risk. Low correlations—generally less than 0.50—are desirable for portfolio diversification.

Historical Correlation among Asset Classes

Correlations among major US asset classes and international stocks are reported in Exhibit 17 for 1970–2017. The highest correlation is between US large company stocks and US small company stocks at about 70 percent, whereas the correlation between US

large company stocks and international stocks is approximately 66 percent. Although these are the highest correlations, they still provide diversification benefits because the correlations are less than 100 percent. The correlation between international stocks and US small company stocks is lower, at 50 percent. The lowest correlations are between stocks and bonds, with some correlations being negative, such as that between US small company stocks and US long-term government bonds. Similarly, the correlation between T-bills and stocks is close to zero.⁴

Exhibit 17: Correlation Among US Assets and International Stocks (1970–2017)

Series	International Stocks	US Large Company Stocks	US Small Company Stocks	US Long-Term Corporate Bonds	US Long-Term Treasury Bonds	US T-Bills	US Inflation
International stocks	1.00						
US large company stocks	0.66	1.00					
US small company stocks	0.50	0.72	1.00				
US long-term corporate bonds	0.02	0.23	0.06	1.00			
US long-term Treasury bonds	−0.13	0.01	−0.15	0.89	1.00		
US T-bills	0.01	0.04	0.02	0.05	0.09	1.00	
US inflation	−0.06	−0.11	0.04	−0.32	−0.26	0.69	1.00

Source: 2018 SBBI Yearbook (Exhibit 12.13).

The low correlations between stocks and bonds are attractive for portfolio diversification. Similarly, including international securities in a portfolio can also control portfolio risk. It is not surprising that most diversified portfolios of investors contain domestic stocks, domestic bonds, foreign stocks, foreign bonds, real estate, cash, and other asset classes.

Avenues for Diversification

The reason for diversification is simple. By constructing a portfolio with assets that do not move together, you create a portfolio that reduces the ups and downs in the short term but continues to grow steadily in the long term. Diversification thus makes a portfolio more resilient to gyrations in financial markets.

We describe a number of approaches for diversification, some of which have been discussed previously and some of which might seem too obvious. Diversification, however, is such an important part of investing that it cannot be emphasized enough, especially when we continue to meet and see many investors who are not properly diversified.

- *Diversify with asset classes.* Correlations among major asset classes⁵ are not usually high, as can be observed from the few US asset classes listed in Exhibit 17. Correlations for other asset classes and other countries are

⁴ In any short period, T-bills are riskless and uncorrelated with other asset classes. For example, a 3-month US Treasury bill is redeemable at its face value upon maturity irrespective of what happens to other assets. When we consider multiple periods, however, returns on T-bills may be related to other asset classes because short-term interest rates vary depending on the strength of the economy and outlook for inflation.

⁵ Major asset classes are distinguished from sub-classes, such as US value stocks and US growth stocks.

also typically low, which provides investors the opportunity to benefit from diversifying among many asset classes to achieve the biggest benefit from diversification. A partial list of asset classes includes domestic large caps, domestic small caps, growth stocks, value stocks, domestic corporate bonds, long-term domestic government bonds, domestic Treasury bills (cash), emerging market stocks, emerging market bonds, developed market stocks (i.e., developed markets excluding domestic market), developed market bonds, real estate, and gold and other commodities. In addition, industries and sectors are used to diversify portfolios. For example, energy stocks may not be well correlated with health care stocks. The exact proportions in which these assets should be included in a portfolio depend on the risk, return, and correlation characteristics of each and the home country of the investor.

- *Diversify with index funds.* Diversifying among asset classes can become costly for small portfolios because of the number of securities required. For example, creating diversified exposure to a single category, such as a domestic large company asset class, may require a group of at least 30 stocks. Exposure to 10 asset classes may require 300 securities, which can be expensive to trade and track. Instead, it may be effective to use exchange-traded funds or mutual funds that track the respective indexes, which could bring down the costs associated with building a well-diversified portfolio. Therefore, many investors should consider index mutual funds as an investment vehicle as opposed to individual securities.
- *Diversification among countries.* Countries are different because of industry focus, economic policy, and political climate. The US economy produces many financial and technical services and invests a significant amount in innovative research. The Chinese and Indian economies, however, are focused on manufacturing. Countries in the European Union are vibrant democracies whereas East Asian countries are experimenting with democracy. Thus, financial returns in one country over time are not likely to be highly correlated with returns in another country. Country returns may also be different because of different currencies. In other words, the return on a foreign investment may be different when translated to the home country's currency. Because currency returns are uncorrelated with stock returns, they may help reduce the risk of investing in a foreign country even when that country, in isolation, is a very risky emerging market from an equity investment point of view. Investment in foreign countries is an essential part of a well-diversified portfolio.
- *Diversify by not owning your employer's stock.* Companies encourage their employees to invest in company stock through employee stock plans and retirement plans. You should evaluate investing in your company, however, just as you would evaluate any other investment. In addition, you should consider the nonfinancial investments that you have made, especially the human capital you have invested in your company. Because you work for your employer, you are already heavily invested in it—your earnings depend on your employer. The level of your earnings, whether your compensation improves or whether you get a promotion, depends on how well your employer performs. If a competitor drives your employer out of the market, you will be out of a job. Additional investments in your employer will concentrate your wealth in one asset even more so and make you less diversified.

- *Evaluate each asset before adding to a portfolio.* Every time you add a security or an asset class to the portfolio, recognize that there is a cost associated with diversification. There is a cost of trading an asset as well as the cost of tracking a larger portfolio. In some cases, the securities or assets may have different names but belong to an asset class in which you already have sufficient exposure. A general rule to evaluate whether a new asset should be included to an existing portfolio is based on the following risk–return trade-off relationship:

$$E(R_{new}) = R_f + \frac{\sigma_{new}\rho_{new,p}}{\sigma_p} \times [E(R_p) - R_f]$$

where $E(R)$ is the return from the asset, R_f is the return on the risk-free asset, σ is the standard deviation, ρ is the correlation coefficient, and the subscripts *new* and *p* refer to the new stock and existing portfolio. If the new asset's risk-adjusted return benefits the portfolio, then the asset should be included. The condition can be rewritten using the Sharpe ratio on both sides of the equation as:

$$\frac{E(R_{new}) - R_f}{\sigma_{new}} > \frac{E(R_p) - R_f}{\sigma_p} \times \rho_{new,p}$$

If the Sharpe ratio of the new asset is greater than the Sharpe ratio of the current portfolio times the correlation coefficient, it is beneficial to add the new asset.

- *Buy insurance for risky portfolios.* It may come as a surprise, but insurance is an investment asset—just a different kind of asset. Insurance has a negative correlation with your assets and is thus very valuable. Insurance gives you a positive return when your assets lose value, but pays nothing if your assets maintain their value. Over time, insurance generates a negative average return. Many individuals, however, are willing to accept a small negative return because insurance reduces their exposure to an extreme loss. In general, it is reasonable to add an investment with a negative return if that investment significantly reduces risk (an example of a classic case of the risk–return trade-off).

Alternatively, investments with negative correlations also exist. Historically, gold has a negative correlation with stocks; however, the expected return is usually small and sometimes even negative. Investors often include gold and other commodities in their portfolios as a way of reducing their overall portfolio risk, including currency risk and inflation risk.

Buying put options is another way of reducing risk. Because put options pay when the underlying asset falls in value (negative correlation), they can protect an investor's portfolio against catastrophic losses. Of course, put options cost money, and the expected return is zero or marginally negative.

EFFICIENT FRONTIER: INVESTMENT OPPORTUNITY SET & MINIMUM VARIANCE PORTFOLIOS

10

- ☐ describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated
- ☐ describe and interpret the minimum-variance and efficient frontiers of risky assets and the global minimum-variance portfolio

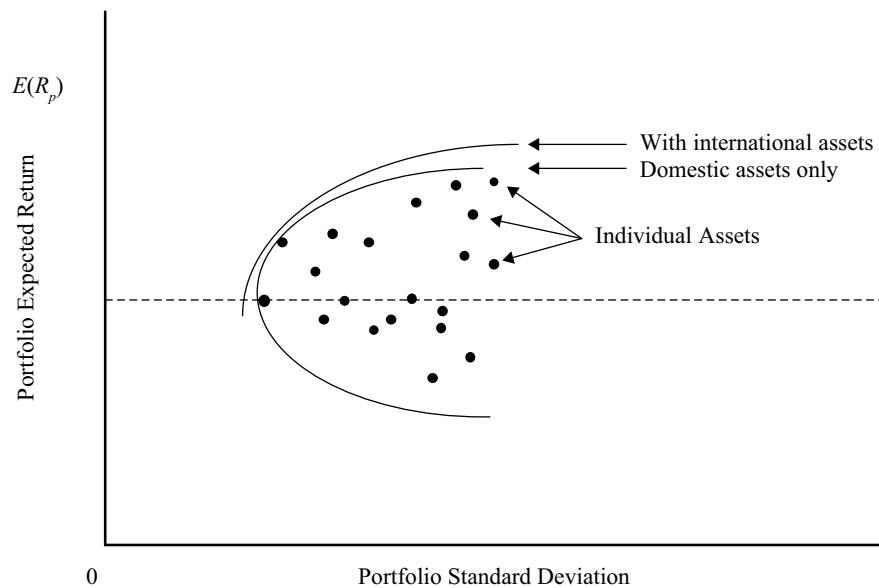
In this section, we formalize the effect of diversification and expand the set of investments to include all available risky assets in a mean–variance framework. The addition of a risk-free asset generates an optimal risky portfolio and the capital allocation line. We can then derive an investor's optimal portfolio by overlaying the capital allocation line with the indifference curves of investors.

Investment Opportunity Set

If two assets are perfectly correlated, the risk–return opportunity set is represented by a straight line connecting those two assets. The line contains portfolios formed by changing the weight of each asset invested in the portfolio. This correlation was depicted by the straight line (with $\rho = 1$) in Exhibit 20. If the two assets are not perfectly correlated, the portfolio's risk is less than the weighted average risk of the components, and the portfolio formed from the two assets bulges on the left as shown by curves with the correlation coefficient (ρ) less than 1.0 in Exhibit 20. All of the points connecting the two assets are achievable (or feasible). The addition of new assets to this portfolio creates more and more portfolios that are either a linear combination of the existing portfolio and the new asset or a curvilinear combination, depending on the correlation between the existing portfolio and the new asset.

As the number of available assets increases, the number of possible combinations increases rapidly. When all investable assets are considered, and there are hundreds and thousands of them, we can construct an opportunity set of investments. The opportunity set will ordinarily span all points within a frontier because it is also possible to reach every possible point within that curve by judiciously creating a portfolio from the investable assets.

We begin with individual investable assets and gradually form portfolios that can be plotted to form a curve as shown in Exhibit 18. All points on the curve and points to the right of the curve are attainable by a combination of one or more of the investable assets. This set of points is called the investment opportunity set. Initially, the opportunity set consists of domestic assets only and is labeled as such in Exhibit 18.

Exhibit 18: Investment Opportunity Set

Addition of Asset Classes

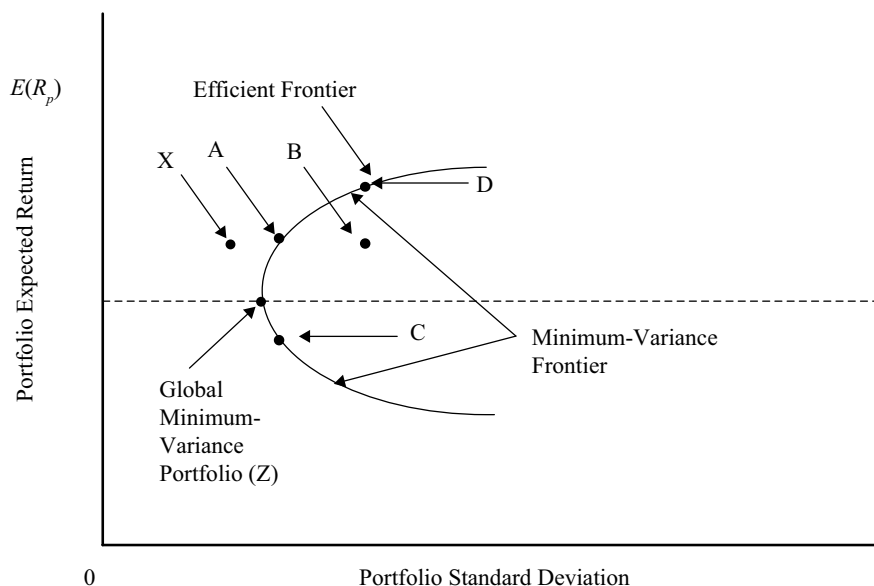
Exhibit 18 shows the effect of adding a new asset class, such as international assets. As long as the new asset class is not perfectly correlated with the existing asset class, the investment opportunity set will expand out further to the northwest, providing a superior risk–return trade-off.

The investment opportunity set with international assets dominates the opportunity set that includes only domestic assets. Adding other asset classes will have the same impact on the opportunity set. Thus, we should continue to add asset classes until they do not further improve the risk–return trade-off. The benefits of diversification can be fully captured in this way in the construction of the investment opportunity set, and eventually in the selection of the optimal portfolio.

In the discussion that follows in this section, we will assume that *all* investable assets available to an investor are included in the investment opportunity set and no special attention needs to be paid to new asset classes or new investment opportunities.

Minimum-Variance Portfolios

The investment opportunity set consisting of all available investable sets is shown in Exhibit 19. There are a large number of portfolios available for investment, but we must choose a single optimal portfolio. In this subsection, we begin the selection process by narrowing the choice to fewer portfolios.

Exhibit 19: Minimum-Variance Frontier

Minimum-Variance Frontier

Risk-averse investors seek to minimize risk for a given return. Consider Points A, B, and X in Exhibit 19 and assume that they are on the same horizontal line by construction. Thus, the three points have the same expected return, $E(R_1)$, as do all other points on the imaginary line connecting A, B, and X. Given a choice, an investor will choose the point with the minimum risk, which is Point X. Point X, however, is unattainable because it does not lie within the investment opportunity set. Thus, the minimum risk that we can attain for $E(R_1)$ is at Point A. Point B and all points to the right of Point A are feasible but they have higher risk. Therefore, a risk-averse investor will choose only Point A in preference to any other portfolio with the same return.

Similarly, Point C is the minimum variance point for the return earned at C. Points to the right of C have higher risk. We can extend the above analysis to all possible returns. In all cases, we find that the **minimum-variance portfolio** is the one that lies on the solid curve drawn in Exhibit 19. The entire collection of these minimum-variance portfolios is referred to as the minimum-variance frontier. The minimum-variance frontier defines the smaller set of portfolios in which investors would want to invest. Note that no risk-averse investor will choose to invest in a portfolio to the right of the minimum-variance frontier because a portfolio on the minimum-variance frontier can give the same return but at a lower risk.

Global Minimum-Variance Portfolio

The left-most point on the minimum-variance frontier is the portfolio with the minimum variance among all portfolios of risky assets, and is referred to as the **global minimum-variance portfolio**. An investor cannot hold a portfolio consisting of *risky* assets that has less risk than that of the global minimum-variance portfolio. Note the emphasis on “risky” assets. Later, the introduction of a risk-free asset will allow us to relax this constraint.

Efficient Frontier of Risky Assets

The minimum-variance frontier gives us portfolios with the minimum variance for a given return. However, investors also want to maximize return for a given risk. Observe Points A and C on the minimum-variance frontier shown in Exhibit 19. Both of them have the same risk. Given a choice, an investor will choose Portfolio A because it has a higher return. No one will choose Portfolio C. The same analysis applies to all points on the minimum-variance frontier that lie below the global minimum-variance portfolio and to the right of the global minimum-variance portfolio are not beneficial and are inefficient portfolios for an investor.

The curve that lies above and to the right of the global minimum-variance portfolio is referred to as the **Markowitz efficient frontier** because it contains all portfolios of risky assets that rational, risk-averse investors will choose.

An important observation that is often ignored is the slope at various points on the efficient frontier. As we move right from the global minimum-variance portfolio (Point Z) in Exhibit 19, there is an increase in risk with a concurrent increase in return. The increase in return with every unit increase in risk, however, keeps decreasing as we move from left to the right because the slope continues to decrease. The slope at Point D is less than the slope at Point A, which is less than the slope at Point Z. The increase in return by moving from Point Z to Point A is the same as the increase in return by moving from Point A to Point D. It can be seen that the additional risk in moving from Point A to Point D is 3 to 4 times more than the additional risk in moving from Point Z to Point A. Thus, investors obtain decreasing increases in returns as they assume more risk.

11

EFFICIENT FRONTIER: A RISK-FREE ASSET AND MANY RISKY ASSETS

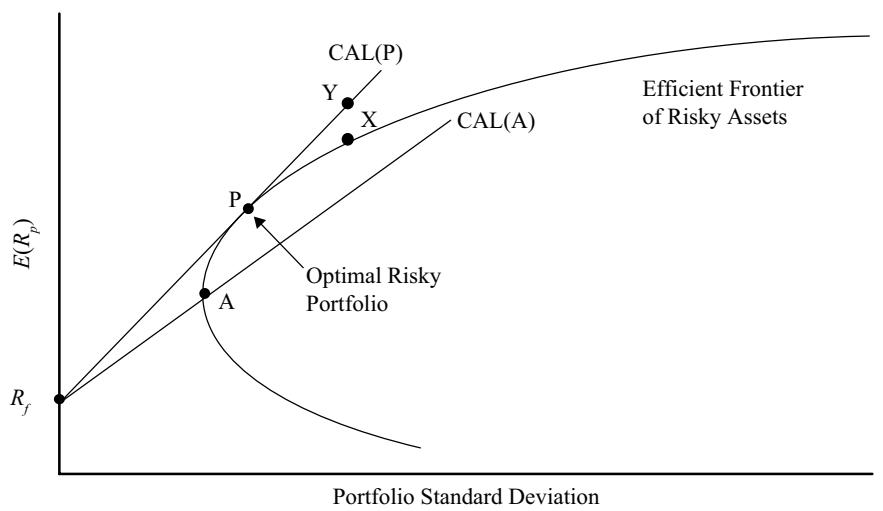


explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line

Until now, we have only considered risky assets in which the return is risky or uncertain. Most investors, however, have access to a risk-free asset, most notably from securities issued by the government. The addition of a risk-free asset makes the investment opportunity set much richer than the investment opportunity set consisting only of risky assets.

Capital Allocation Line and Optimal Risky Portfolio

By definition, a risk-free asset has zero risk so it must lie on the y -axis in a mean-variance graph. A risk-free asset with a return of R_f is plotted in Exhibit 20. This asset can now be combined with a portfolio of risky assets. The combination of a risk-free asset with a portfolio of risky assets is a straight line, such as in Section 11 (see Exhibit 15). Unlike in Section 11, however, we have many risky portfolios to choose from instead of a single risky portfolio.

Exhibit 20: Optimal Risky Portfolio

All portfolios on the efficient frontier are candidates for being combined with the risk-free asset. Two combinations are shown in Exhibit 20: one between the risk-free asset and efficient Portfolio A and the other between the risk-free asset and efficient Portfolio P. Comparing capital allocation line A and capital allocation line P reveals that there is a point on CAL(P) with a higher return and same risk for each point on CAL(A). In other words, the portfolios on CAL(P) dominate the portfolios on CAL(A). Therefore, an investor will choose CAL(P) over CAL(A). We would like to move further northwest to achieve even better portfolios. None of those portfolios, however, is attainable because they are above the efficient frontier.

What about other points on the efficient frontier? For example, Point X is on the efficient frontier and has the highest return of all risky portfolios for its risk. However, Point Y on CAL(P), achievable by leveraging Portfolio P as seen in Section 11, lies above Point X and has the same risk but higher return. In the same way, we can observe that not only does CAL(P) dominate CAL(A) but it also dominates the Markowitz efficient frontier of risky assets.

CAL(P) is the optimal capital allocation line and Portfolio P is the optimal risky portfolio. Thus, with the addition of the risk-free asset, we are able to narrow our selection of risky portfolios to a single optimal risky portfolio, P, which is at the tangent of CAL(P) and the efficient frontier of risky assets.

The Two-Fund Separation Theorem

The **two-fund separation theorem** states that all investors regardless of taste, risk preferences, and initial wealth will hold a combination of two portfolios or funds: a risk-free asset and an optimal portfolio of risky assets.⁶

The separation theorem allows us to divide an investor's investment problem into two distinct steps: the investment decision and the financing decision. In the first step, as in the previous analysis, the investor identifies the optimal risky portfolio. The optimal risky portfolio is selected from numerous risky portfolios without considering the investor's preferences. The investment decision at this step is based on the optimal risky portfolio's (a single portfolio) return, risk, and correlations.

⁶ In the next reading, you will learn that the optimal portfolio of risky assets is the market portfolio.

The capital allocation line connects the optimal risky portfolio and the risk-free asset. All optimal investor portfolios must be on this line. Each investor's optimal portfolio on the CAL(P) is determined in the second step. Considering each individual investor's risk preference, using indifference curves, determines the investor's allocation to the risk-free asset (lending) and to the optimal risky portfolio. Portfolios beyond the optimal risky portfolio are obtained by borrowing at the risk-free rate (i.e., buying on margin). Therefore, the individual investor's risk preference determines the amount of financing (i.e., lending to the government instead of investing in the optimal risky portfolio or borrowing to purchase additional amounts of the optimal risky portfolio).

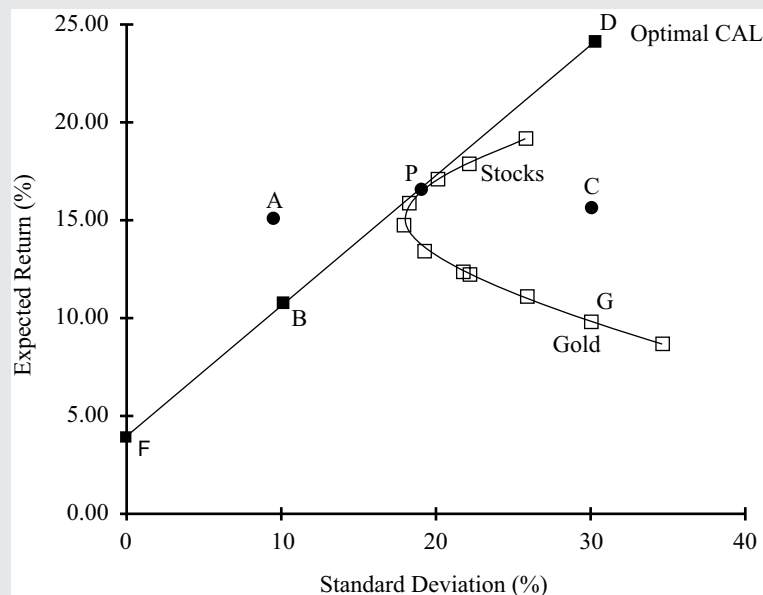
EXAMPLE 7

Choosing the Right Portfolio

In Exhibit 21, the risk and return of the points marked are as follows:

Point	Return (%)	Risk (%)	Point (%)	Return (%)	Risk (%)
A	15	10	B	11	10
C	15	30	D	25	30
F	4	0	G (gold)	10	30
P	16	17			

Exhibit 21



Answer the following questions with reference to the points plotted on Exhibit 21 and explain your answers. The investor is choosing one portfolio based on the graph.

1. Which of the above points is not achievable?

Solution:

Portfolio A is not attainable because it lies outside the feasible set and not on the capital allocation line.

2. Which of these portfolios will not be chosen by a rational, risk-averse investor?

Solution:

Portfolios G and C will not be chosen because D provides higher return for the same risk. G and C are the only investable points that do not lie on the capital allocation line.

3. Which of these portfolios is most suitable for a risk-neutral investor?

Solution:

Portfolio D is most suitable because a risk-neutral investor cares only about return and portfolio D provides the highest return. $A = 0$ in the utility formula.

4. Gold is on the inefficient part of the feasible set. Nonetheless, gold is owned by many rational investors as part of a larger portfolio. Why?

Solution:

Gold may be owned as part of a portfolio (not as *the* portfolio) because gold has low or negative correlation with many risky assets, such as stocks. Being part of a portfolio can thus reduce overall risk even though its standalone risk is high and return is low. Note that gold's price is not stable—its return is very risky (30 percent). Even risk seekers will choose D over G, which has the same risk but higher return.

5. What is the utility of an investor at point P with a risk aversion coefficient of 3?

Solution:

$$U = E(r) - 0.5A\sigma^2 = 0.16 - 0.5 \times 3 \times 0.0289 = 0.1167 = 11.67\%.$$

EFFICIENT FRONTIER: OPTIMAL INVESTOR PORTFOLIO

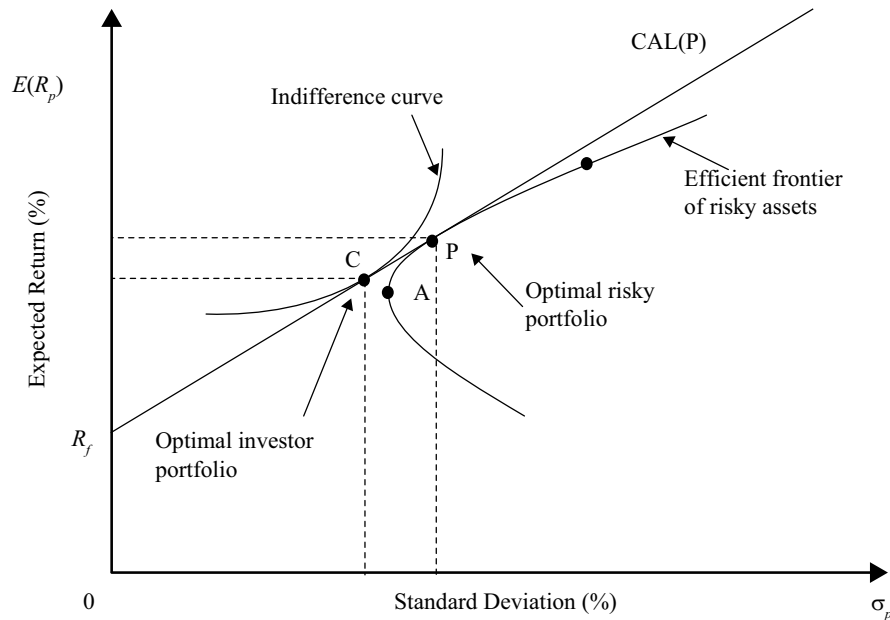
12



explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line

The CAL(P) in Exhibit 22 contains the best possible portfolios available to investors. Each of those portfolios is a linear combination of the risk-free asset and the optimal risky portfolio. Among the available portfolios, the selection of each investor's optimal portfolio depends on the risk preferences of an investor. In Sections 9–11, we discussed that the individual investor's risk preferences are incorporated into their indifference curves. These can be used to select the optimal portfolio.

Exhibit 22 shows an indifference curve that is tangent to the capital allocation line, CAL(P). Indifference curves with higher utility than this one lie above the capital allocation line, so their portfolios are not achievable. Indifference curves that lie below this one are not preferred because they have lower utility. Thus, the optimal portfolio for the investor with this indifference curve is portfolio C on CAL(P), which is tangent to the indifference curve.

Exhibit 22: Optimal Investor Portfolio**EXAMPLE 8****Comprehensive Example on Portfolio Selection**

This comprehensive example reviews many concepts learned in this reading. The example begins with simple information about available assets and builds an optimal investor portfolio for the Lohrmanns.

Suppose the Lohrmanns can invest in only two risky assets, A and B. The expected return and standard deviation for asset A are 20 percent and 50 percent, and the expected return and standard deviation for asset B are 15 percent and 33 percent. The two assets have zero correlation with one another.

1. Calculate portfolio expected return and portfolio risk (standard deviation) if an investor invests 10 percent in A and the remaining 90 percent in B.

Solution

The subscript “ rp ” means risky portfolio.

$$R_{rp} = [0.10 \times 20\%] + [(1 - 0.10) \times 15\%] = 0.155 = 15.50\%$$

$$\begin{aligned} \sigma_{rp} &= \sqrt{w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \rho_{AB} \sigma_A \sigma_B} \\ &= \sqrt{(0.10^2 \times 0.50^2) + (0.90^2 \times 0.33^2) + (2 \times 0.10 \times 0.90 \times 0.0 \times 0.50 \times 0.33)} \\ &= 0.3012 = 30.12\% \end{aligned}$$

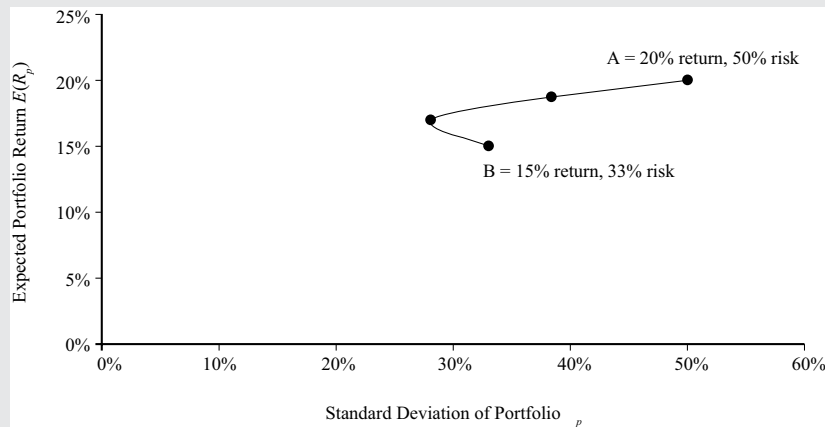
Note that the correlation coefficient is 0, so the last term for standard deviation is zero.

2. Generalize the above calculations for portfolio return and risk by assuming an investment of w_A in Asset A and an investment of $(1 - w_A)$ in Asset B.

Solution

$$\begin{aligned}
 R_{rp} &= w_A \times 20\% + (1 - w_A) \times 15\% = 0.05 w_A + 0.15 \\
 \sigma_{rp} &= \sqrt{w_A^2 \times 0.5^2 + (1 - w_A)^2 \times 0.33^2} = \sqrt{0.25 w_A^2 + 0.1089(1 - 2 w_A + w_A^2)} \\
 &= \sqrt{0.3589 w_A^2 - 0.2178 w_A + 0.1089}
 \end{aligned}$$

The investment opportunity set can be constructed by using different weights in the expressions for $E(R_{rp})$ and σ_{rp} in Part 1 of this example. Exhibit 23 shows the combination of Assets A and B.

Exhibit 23

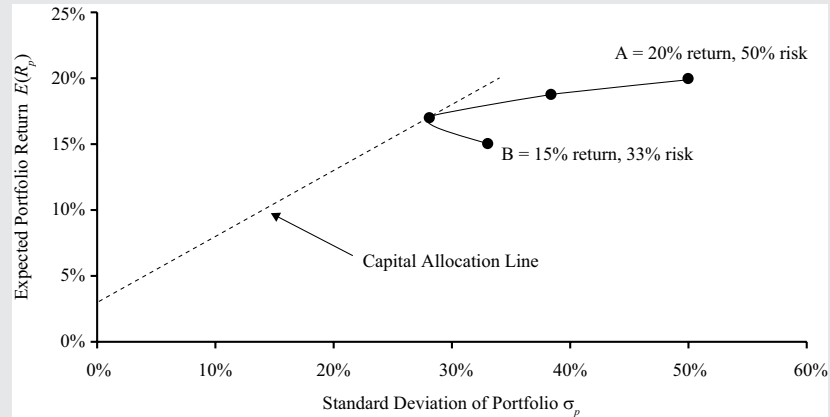
3. Now introduce a risk-free asset with a return of 3 percent. Write an equation for the capital allocation line in terms of w_A that will connect the risk-free asset to the portfolio of risky assets. (Hint: use the equation in Section 11 and substitute the expressions for a risky portfolio's risk and return from Part 2 above).

Solution

The equation of the line connecting the risk-free asset to the portfolio of risky assets is given below (see Section 11), where the subscript “ rp ” refers to the risky portfolio instead of “ i ,” and the subscript “ p ” refers to the new portfolio of two risky assets and one risk-free asset.

$$\begin{aligned}
 E(R_p) &= R_f + \frac{E(R_{rp}) - R_f}{\sigma_{rp}} \sigma_p \\
 \text{Rewritten as} \\
 E(R_p) &= R_f + \frac{E(R_{rp}) - R_f}{\sigma_{rp}} \sigma_p \\
 &= 0.03 + \frac{0.05 w_A + 0.15 - 0.03}{\sqrt{0.3589 w_A^2 - 0.2178 w_A + 0.1089}} \sigma_p \\
 &= 0.03 + \frac{0.05 w_A + 0.12}{\sqrt{0.3589 w_A^2 - 0.2178 w_A + 0.1089}} \sigma_p
 \end{aligned}$$

The capital allocation line is the line that has the maximum slope because it is tangent to the curve formed by portfolios of the two risky assets. Exhibit 24 shows the capital allocation line based on a risk-free asset added to the group of assets.

Exhibit 24

4. The slope of the capital allocation line is maximized when the weight in Asset A is 38.20 percent.⁷ What is the equation for the capital allocation line using w_A of 38.20 percent?

Solution

By substituting 38.20 percent for w_A in the equation in Part 3, we get $E(R_p) = 0.03 + 0.4978\sigma_p$ as the capital allocation line.

5. Having created the capital allocation line, we turn to the Lohrmanns. What is the standard deviation of a portfolio that gives a 20 percent return and is on the capital allocation line? How does this portfolio compare with asset A?

Solution

Solve the equation for the capital allocation line to get the standard deviation: $0.20 = 0.03 + 0.4978\sigma_p$, $\sigma_p = 34.2\%$. The portfolio with a 20 percent return has the same return as Asset A but a lower standard deviation, 34.2 percent instead of 50.0 percent.

6. What is the risk of portfolios with returns of 3 percent, 9 percent, 15 percent, and 20 percent?

Solution

You can find the risk of the portfolio using the equation for the capital allocation line: $E(R_p) = 0.03 + 0.4978\sigma_p$.

For a portfolio with a return of 15 percent, write $0.15 = 0.03 + 0.4978\sigma_p$. Solving for σ_p gives 24.1 percent. You can similarly calculate risks of other portfolios with the given returns.

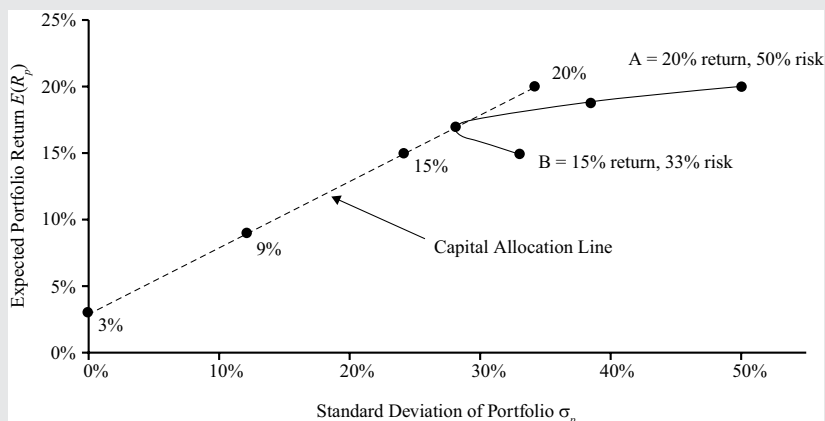
The risk of the portfolio for a return of 3 percent is 0.0 percent, for a return of 9 percent is 12.1 percent, for a return of 15 percent is 24.1 percent, and for a return of 20 percent is 34.2 percent. The points are plotted in Exhibit 25.

⁷ You can maximize

$$\frac{0.05w_A + 0.12}{\sqrt{0.3589w_A^2 - 0.2178w_A + 0.1089}}$$

by taking the first derivative of the slope with respect to w_A and setting it to 0.

Exhibit 25



7. What is the utility that the Lohrmanns derive from a portfolio with a return of 3 percent, 9 percent, 15 percent, and 20 percent? The risk aversion coefficient for the Lohrmanns is 2.5.

Solution

To find the utility, use the utility formula with a risk aversion coefficient of 2.5:

$$\text{Utility} = E(R_p) - 0.5 \times 2.5 \sigma_p^2$$

$$\text{Utility (3\%)} = 0.0300$$

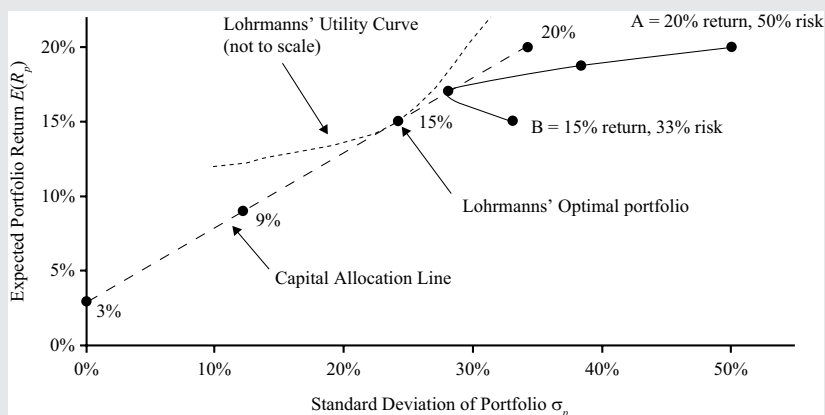
$$\text{Utility (9\%)} = 0.09 - 0.5 \times 2.5 \times 0.121^2 = +0.0717$$

$$\text{Utility (15\%)} = 0.15 - 0.5 \times 2.5 \times 0.241^2 = +0.0774$$

$$\text{Utility (20\%)} = 0.20 - 0.5 \times 2.5 \times 0.341^2 = +0.0546$$

Based on the above information, the Lohrmanns choose a portfolio with a return of 15 percent and a standard deviation of 24.1 percent because it has the highest utility: 0.0774. Finally, Exhibit 26 shows the indifference curve that is tangent to the capital allocation line to generate Lohrmanns' optimal investor portfolio.

Exhibit 26



Investor Preferences and Optimal Portfolios

The location of an optimal investor portfolio depends on the investor's risk preferences. A highly risk-averse investor may invest a large proportion, even 100 percent, of his/her assets in the risk-free asset. The optimal portfolio in this investor's case will be located close to the y -axis. A less risk-averse investor, however, may invest a large portion of his/her wealth in the optimal risky asset. The optimal portfolio in this investor's case will lie closer to Point P in Exhibit 22.

Some less risk-averse investors (i.e., with a high risk tolerance) may wish to accept even more risk because of the chance of higher return. Such an investor may borrow money to invest more in the risky portfolio. If the investor borrows 25 percent of his wealth, he/she can invest 125 percent in the optimal risky portfolio. The optimal investor portfolio for such an investor will lie to the right of Point P on the capital allocation line.

Thus, moving from the risk-free asset along the capital allocation line, we encounter investors who are willing to accept more risk. At Point P, the investor is 100 percent invested in the optimal risky portfolio. Beyond Point P, the investor accepts even more risk by borrowing money and investing in the optimal risky portfolio.

Note that we are able to accommodate all types of investors with just two portfolios: the risk-free asset and the optimal risky portfolio. Exhibit 22 is also an illustration of the two-fund separation theorem. Portfolio P is the optimal risky portfolio that is selected without regard to investor preferences. The optimal investor portfolio is selected on the capital allocation line by overlaying the indifference curves that incorporate investor preferences.

SUMMARY

This reading provides a description and computation of investment characteristics, such as risk and return, that investors use in evaluating assets for investment. This was followed by sections about portfolio construction, selection of an optimal risky portfolio, and an understanding of risk aversion and indifference curves. Finally, the tangency point of the indifference curves with the capital allocation line allows identification of the optimal investor portfolio. Key concepts covered in the reading include the following:

- Holding period return is most appropriate for a single, predefined holding period.
- Multiperiod returns can be aggregated in many ways. Each return computation has special applications for evaluating investments.
- Risk-averse investors make investment decisions based on the risk–return trade-off, maximizing return for the same risk, and minimizing risk for the same return. They may be concerned, however, by deviations from a normal return distribution and from assumptions of financial markets' operational efficiency.
- Investors are risk averse, and historical data confirm that financial markets price assets for risk-averse investors.
- The risk of a two-asset portfolio is dependent on the proportions of each asset, their standard deviations and the correlation (or covariance) between the assets' returns. As the number of assets in a portfolio increases, the correlation among asset risks becomes a more important determinant of portfolio risk.

- Combining assets with low correlations reduces portfolio risk.
- The two-fund separation theorem allows us to separate decision making into two steps. In the first step, the optimal risky portfolio and the capital allocation line are identified, which are the same for all investors. In the second step, investor risk preferences enable us to find a unique optimal investor portfolio for each investor.
- The addition of a risk-free asset creates portfolios that are dominant to portfolios of risky assets in all cases except for the optimal risky portfolio.

By successfully understanding the content of this reading, you should be comfortable calculating an investor's optimal portfolio given the investor's risk preferences and universe of investable assets available.

PRACTICE PROBLEMS

1. With respect to trading costs, liquidity is *least likely* to impact the:
 - A. stock price.
 - B. bid–ask spreads.
 - C. brokerage commissions.
2. Evidence of risk aversion is *best* illustrated by a risk–return relationship that is:
 - A. negative.
 - B. neutral.
 - C. positive.
3. With respect to risk-averse investors, a risk-free asset will generate a numerical utility that is:
 - A. the same for all individuals.
 - B. positive for risk-averse investors.
 - C. equal to zero for risk seeking investors.
4. With respect to utility theory, the most risk-averse investor will have an indifference curve with the:
 - A. most convexity.
 - B. smallest intercept value.
 - C. greatest slope coefficient.
5. With respect to an investor's utility function expressed as: $U = E(r) - \frac{1}{2}A\sigma^2$, which of the following values for the measure for risk aversion has the *least* amount of risk aversion?
 - A. -4.
 - B. 0.
 - C. 4.

The following information relates to questions 6-7

A financial planner has created the following data to illustrate the application of utility theory to portfolio selection:

Investment	Expected Return (%)	Expected Standard Deviation (%)
1	18	2
2	19	8
3	20	15
4	18	30

6. A risk-neutral investor is *most likely* to choose:
- Investment 1.
 - Investment 2.
 - Investment 3.
7. If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of -2 , the risk-seeking investor is *most likely* to choose:
- Investment 2.
 - Investment 3.
 - Investment 4.
8. If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of 2 , the risk-averse investor is *most likely* to choose:
- Investment 1.
 - Investment 2.
 - Investment 3.
9. If an investor's utility function is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$ and the measure for risk aversion has a value of 4 , the risk-averse investor is *most likely* to choose:
- Investment 1.
 - Investment 2.
 - Investment 3.
10. With respect to the mean–variance portfolio theory, the capital allocation line, CAL, is the combination of the risk-free asset and a portfolio of all:
- risky assets.
 - equity securities.
 - feasible investments.
11. Two individual investors with different levels of risk aversion will have optimal portfolios that are:
- below the capital allocation line.

- B. on the capital allocation line.
- C. above the capital allocation line.
12. With respect to capital market theory, which of the following asset characteristics is *least likely* to impact the variance of an investor's equally weighted portfolio?
- A. Return on the asset.
- B. Standard deviation of the asset.
- C. Covariances of the asset with the other assets in the portfolio.
13. A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

If the correlation of returns between the two securities is 0.40, the expected standard deviation of the portfolio is *closest* to:

- A. 10.7%.
- B. 11.3%.
- C. 12.1%.
14. A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

If the covariance of returns between the two securities is -0.0240 , the expected standard deviation of the portfolio is *closest* to:

- A. 2.4%.
- B. 7.5%.
- C. 9.2%.

The following information relates to questions 15-16

A portfolio manager creates the following portfolio:

Security	Security Weight (%)	Expected Standard Deviation (%)
1	30	20
2	70	12

15. If the standard deviation of the portfolio is 14.40%, the correlation between the two securities is equal to:
- A. -1.0.
 - B. 0.0.
 - C. 1.0.
16. If the standard deviation of the portfolio is 14.40%, the covariance between the two securities is equal to:
- A. 0.0006.
 - B. 0.0240.
 - C. 1.0000.

The following information relates to questions 17-19

A portfolio manager creates the following portfolio:

Security	Expected Annual Return (%)	Expected Standard Deviation (%)
1	16	20
2	12	20

17. If the portfolio of the two securities has an expected return of 15%, the proportion invested in Security 1 is:
- A. 25%.
 - B. 50%.
 - C. 75%.
18. If the correlation of returns between the two securities is -0.15, the expected standard deviation of an equal-weighted portfolio is *closest* to:
- A. 13.04%.
 - B. 13.60%.
 - C. 13.87%.
19. If the two securities are uncorrelated, the expected standard deviation of an

equal-weighted portfolio is *closest* to:

- A. 14.00%.
- B. 14.14%.
- C. 20.00%.

The following information relates to questions 20-21

An analyst has made the following return projections for each of three possible outcomes with an equal likelihood of occurrence:

Asset	Outcome 1 (%)	Outcome 2 (%)	Outcome 3 (%)	Expected Return (%)
1	12	0	6	6
2	12	6	0	6
3	0	6	12	6

20. If the analyst constructs two-asset portfolios that are equally-weighted, which pair of assets has the *lowest* expected standard deviation?
- A. Asset 1 and Asset 2.
 - B. Asset 1 and Asset 3.
 - C. Asset 2 and Asset 3.
21. If the analyst constructs two-asset portfolios that are equally weighted, which pair of assets provides the *least* amount of risk reduction?
- A. Asset 1 and Asset 2.
 - B. Asset 1 and Asset 3.
 - C. Asset 2 and Asset 3.
-
22. As the number of assets in an equally-weighted portfolio increases, the contribution of each individual asset's variance to the volatility of the portfolio:
- A. increases.
 - B. decreases.
 - C. remains the same.
23. With respect to an equally weighted portfolio made up of a large number of assets, which of the following contributes the *most* to the volatility of the portfolio?
- A. Average variance of the individual assets.
 - B. Standard deviation of the individual assets.

- C. Average covariance between all pairs of assets.
24. The correlation between assets in a two-asset portfolio increases during a market decline. If there is no change in the proportion of each asset held in the portfolio or the expected standard deviation of the individual assets, the volatility of the portfolio is *most likely* to:
- A. increase.
 - B. decrease.
 - C. remain the same.
25. Which of the following statements is *least* accurate? The efficient frontier is the set of all attainable risky assets with the:
- A. highest expected return for a given level of risk.
 - B. lowest amount of risk for a given level of return.
 - C. highest expected return relative to the risk-free rate.
26. The portfolio on the minimum-variance frontier with the lowest standard deviation is:
- A. unattainable.
 - B. the optimal risky portfolio.
 - C. the global minimum-variance portfolio.
27. The set of portfolios on the minimum-variance frontier that dominates all sets of portfolios below the global minimum-variance portfolio is the:
- A. capital allocation line.
 - B. Markowitz efficient frontier.
 - C. set of optimal risky portfolios.
28. The dominant capital allocation line is the combination of the risk-free asset and the:
- A. optimal risky portfolio.
 - B. levered portfolio of risky assets.
 - C. global minimum-variance portfolio.
29. Compared to the efficient frontier of risky assets, the dominant capital allocation line has higher rates of return for levels of risk greater than the optimal risky portfolio because of the investor's ability to:
- A. lend at the risk-free rate.
 - B. borrow at the risk-free rate.
 - C. purchase the risk-free asset.
30. With respect to the mean–variance theory, the optimal portfolio is determined

by each individual investor's:

- A. risk-free rate.
- B. borrowing rate.
- C. risk preference.

SOLUTIONS

1. C is correct. Brokerage commissions are negotiated with the brokerage firm. A security's liquidity impacts the operational efficiency of trading costs. Specifically, liquidity impacts the bid–ask spread and can impact the stock price (if the ability to sell the stock is impaired by the uncertainty associated with being able to sell the stock).
2. C is correct. Historical data over long periods of time indicate that there exists a positive risk–return relationship, which is a reflection of an investor's risk aversion.
3. A is correct. A risk-free asset has a variance of zero and is not dependent on whether the investor is risk neutral, risk seeking or risk averse. That is, given that the utility function of an investment is expressed as $U = E(r) - \frac{1}{2}A\sigma^2$, where A is the measure of risk aversion, then the sign of A is irrelevant if the variance is zero (like that of a risk-free asset).
4. C is correct. The most risk-averse investor has the indifference curve with the greatest slope.
5. A is correct. A negative value in the given utility function indicates that the investor is a risk seeker.
6. C is correct. Investment 3 has the highest rate of return. Risk is irrelevant to a risk-neutral investor, who would have a measure of risk aversion equal to 0. Given the utility function, the risk-neutral investor would obtain the greatest amount of utility from Investment 3.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 0$
1	18	2	0.1800
2	19	8	0.1900
3	20	15	0.2000
4	18	30	0.1800

7. C is correct. Investment 4 provides the highest utility value (0.2700) for a risk-seeking investor, who has a measure of risk aversion equal to -2 .

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = -2$
1	18	2	0.1804
2	19	8	0.1964
3	20	15	0.2225
4	18	30	0.2700

8. B is correct. Investment 2 provides the highest utility value (0.1836) for a risk-averse investor who has a measure of risk aversion equal to 2.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 2$
1	18	2	0.1796
2	19	8	0.1836
3	20	15	0.1775
4	18	30	0.0900

9. A is correct. Investment 1 provides the highest utility value (0.1792) for a risk-averse investor who has a measure of risk aversion equal to 4.

Investment	Expected Return (%)	Expected Standard Deviation (%)	Utility $A = 4$
1	18	2	0.1792
2	19	8	0.1772
3	20	15	0.1550
4	18	30	0.0000

10. A is correct. The CAL is the combination of the risk-free asset with zero risk and the portfolio of all risky assets that provides for the set of feasible investments. Allowing for borrowing at the risk-free rate and investing in the portfolio of all risky assets provides for attainable portfolios that dominate risky assets below the CAL.
11. B is correct. The CAL represents the set of all feasible investments. Each investor's indifference curve determines the optimal combination of the risk-free asset and the portfolio of all risky assets, which must lie on the CAL.
12. A is correct. The asset's returns are not used to calculate the portfolio's variance [only the assets' weights, standard deviations (or variances), and covariances (or correlations) are used].
13. C is correct.

$$\begin{aligned}
 \sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\
 &= \sqrt{(0.3)^2 (20\%)^2 + (0.7)^2 (12\%)^2 + 2(0.3)(0.7)(0.40)(20\%)(12\%)} \\
 &= (0.3600\% + 0.7056\% + 0.4032\%)^{0.5} = (1.4688\%)^{0.5} = 12.11\%
 \end{aligned}$$

14. A is correct.

$$\begin{aligned}
 \sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \text{Cov}(R_1, R_2)} \\
 &= \sqrt{(0.3)^2 (20\%)^2 + (0.7)^2 (12\%)^2 + 2(0.3)(0.7)(-0.0240)} \\
 &= (0.3600\% + 0.7056\% - 1.008\%)^{0.5} = (0.0576\%)^{0.5} = 2.40\%
 \end{aligned}$$

15. C is correct. A portfolio standard deviation of 14.40% is the weighted average, which is possible only if the correlation between the securities is equal to 1.0.
16. B is correct. A portfolio standard deviation of 14.40% is the weighted average, which is possible only if the correlation between the securities is equal to 1.0. If the correlation coefficient is equal to 1.0, then the covariance must equal 0.0240, calculated as: $\text{Cov}(R_1, R_2) = \rho_{12} \sigma_1 \sigma_2 = (1.0)(20\%)(12\%) = 2.40\% = 0.0240$.

17. C is correct.

$$\begin{aligned} R_p &= w_1 \times R_1 + (1 - w_1) \times R_2 \\ R_p &= w_1 \times 16\% + (1 - w_1) \times 12\% \\ 15\% &= 0.75(16\%) + 0.25(12\%) \end{aligned}$$

18. A is correct.

$$\begin{aligned} \sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\ &= \sqrt{(0.5)^2 (20\%)^2 + (0.5)^2 (20\%)^2 + 2(0.5)(0.5)(-0.15)(20\%)(20\%)} \\ &= (1.0000\% + 1.0000\% - 0.3000\%)^{0.5} = (1.7000\%)^{0.5} = 13.04\% \end{aligned}$$

19. B is correct.

$$\begin{aligned} \sigma_{port} &= \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2} \\ &= \sqrt{(0.5)^2 (20\%)^2 + (0.5)^2 (20\%)^2 + 2(0.5)(0.5)(0.00)(20\%)(20\%)} \\ &= (1.0000\% + 1.0000\% - 0.0000\%)^{0.5} = (2.0000\%)^{0.5} = 14.14\% \end{aligned}$$

20. C is correct. An equally weighted portfolio of Asset 2 and Asset 3 will have the lowest portfolio standard deviation, because for each outcome, the portfolio has the same expected return (they are perfectly negatively correlated).

21. A is correct. An equally weighted portfolio of Asset 1 and Asset 2 has the highest level of volatility of the three pairs. All three pairs have the same expected return; however, the portfolio of Asset 1 and Asset 2 provides the least amount of risk reduction.

22. B is correct. The contribution of each individual asset's variance (or standard deviation) to the portfolio's volatility decreases as the number of assets in the equally weighted portfolio increases. The contribution of the co-movement measures between the assets increases (i.e., covariance and correlation) as the number of assets in the equally weighted portfolio increases. The following equation for the variance of an equally weighted portfolio illustrates these points: $\sigma_p^2 = \frac{\sigma^2}{N} + \frac{N-1}{N} \overline{COV}$.

$$COV = \frac{\sigma^2}{N} + \frac{N-1}{N} \bar{\rho} \sigma^2.$$

23. C is correct. The co-movement measures between the assets increases (i.e., covariance and correlation) as the number of assets in the equally weighted portfolio increases. The contribution of each individual asset's variance (or standard deviation) to the portfolio's volatility decreases as the number of assets in the equally weighted portfolio increases. The following equation for the variance of an equally weighted portfolio illustrates these points:

$$\sigma_p^2 = \frac{\sigma^2}{N} + \frac{N-1}{N} \overline{COV} = \frac{\sigma^2}{N} + \frac{N-1}{N} \bar{\rho} \sigma^2.$$

24. A is correct. Higher correlations will produce less diversification benefits provided that the other components of the portfolio standard deviation do not change (i.e., the weights and standard deviations of the individual assets).

25. C is correct. The efficient frontier does not account for the risk-free rate. The efficient frontier is the set of all attainable risky assets with the highest expected return for a given level of risk or the lowest amount of risk for a given level of return.

26. C is correct. The global minimum-variance portfolio is the portfolio on the minimum-variance frontier with the lowest standard deviation. Although

the portfolio is attainable, when the risk-free asset is considered, the global minimum-variance portfolio is not the optimal risky portfolio.

- 27. B is correct. The Markowitz efficient frontier has higher rates of return for a given level of risk. With respect to the minimum-variance portfolio, the Markowitz efficient frontier is the set of portfolios above the global minimum-variance portfolio that dominates the portfolios below the global minimum-variance portfolio.
- 28. A is correct. The use of leverage and the combination of a risk-free asset and the optimal risky asset will dominate the efficient frontier of risky assets (the Markowitz efficient frontier).
- 29. B is correct. The CAL dominates the efficient frontier at all points except for the optimal risky portfolio. The ability of the investor to purchase additional amounts of the optimal risky portfolio by borrowing (i.e., buying on margin) at the risk-free rate makes higher rates of return for levels of risk greater than the optimal risky asset possible.
- 30. C is correct. Each individual investor's optimal mix of the risk-free asset and the optimal risky asset is determined by the investor's risk preference.

LEARNING MODULE

2

Portfolio Risk and Return: Part II

by Vijay Singal, PhD, CFA.

*Vijay Singal, PhD, CFA, is at Virginia Tech (USA).***LEARNING OUTCOMES**

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe the implications of combining a risk-free asset with a portfolio of risky assets
☐	explain the capital allocation line (CAL) and the capital market line (CML)
☐	explain systematic and nonsystematic risk, including why an investor should not expect to receive additional return for bearing nonsystematic risk
☐	explain return generating models (including the market model) and their uses
☐	calculate and interpret beta
☐	explain the capital asset pricing model (CAPM), including its assumptions, and the security market line (SML)
☐	calculate and interpret the expected return of an asset using the CAPM
☐	describe and demonstrate applications of the CAPM and the SML
☐	calculate and interpret the Sharpe ratio, Treynor ratio, M^2 , and Jensen's alpha

INTRODUCTION**1**

Our objective in this reading is to identify the optimal risky portfolio for all investors by using the capital asset pricing model (CAPM). The foundation of this reading is the computation of risk and return of a portfolio and the role that correlation plays in diversifying portfolio risk and arriving at the efficient frontier. The efficient frontier and the capital allocation line consist of portfolios that are generally acceptable to all investors. By combining an investor's individual indifference curves with the market-determined capital allocation line, we are able to illustrate that the only optimal risky portfolio for an investor is the portfolio of all risky assets (i.e., the market).

Additionally, we discuss the capital market line, a special case of the capital allocation line that is used for passive investor portfolios. We also differentiate between systematic and nonsystematic risk, and explain why investors are compensated for bearing systematic risk but receive no compensation for bearing nonsystematic risk. We discuss in detail the CAPM, which is a simple model for estimating asset returns based only on the asset's systematic risk. Finally, we illustrate how the CAPM allows security selection to build an optimal portfolio for an investor by changing the asset mix beyond a passive market portfolio.

The reading is organized as follows. In Section 2, we discuss the consequences of combining a risk-free asset with the market portfolio and provide an interpretation of the capital market line. Section 3 decomposes total risk into systematic and nonsystematic risk and discusses the characteristics of and differences between the two kinds of risk. We also introduce return-generating models, including the single-index model, and illustrate the calculation of beta. In Section 4, we introduce the capital asset pricing model and the security market line. Our focus on the CAPM does not suggest that the CAPM is the only viable asset pricing model. Although the CAPM is an excellent starting point, more advanced readings expand on these discussions and extend the analysis to other models that account for multiple explanatory factors. Section 5 covers several post-CAPM developments in theory. Section 6 covers measures for evaluating the performance of a portfolio which take account of risk. Section 7 covers some applications of the CAPM in portfolio construction. A summary and practice problems conclude the reading.

2

CAPITAL MARKET THEORY: RISK-FREE AND RISKY ASSETS

- ☐ describe the implications of combining a risk-free asset with a portfolio of risky assets
- ☐ explain the capital allocation line (CAL) and the capital market line (CML)

You have learned how to combine a risk-free asset with one risky asset and with many risky assets to create a capital allocation line. In this section, we will expand our discussion of multiple risky assets and consider a special case of the capital allocation line, called the capital market line. While discussing the capital market line, we will define the market and its role in passive portfolio management. Using these concepts, we will illustrate how leveraged portfolios can enhance both risk and return.

Portfolio of Risk-Free and Risky Assets

Although investors desire an asset that produces the highest return and carries the lowest risk, such an asset does not exist. As the risk–return capital market theory illustrates, one must assume higher risk in order to earn a higher return. We can improve an investor's portfolio, however, by expanding the opportunity set of risky assets because this allows the investor to choose a superior mix of assets.

Similarly, an investor's portfolio improves if a risk-free asset is added to the mix. In other words, a combination of the risk-free asset and a risky asset can result in a better risk–return trade-off than an investment in only one type of asset because the

risk-free asset has zero correlation with the risky asset. The combination is called the **capital allocation line** (and is depicted in Exhibit 2). Superimposing an investor's indifference curves on the capital allocation line will lead to the optimal investor portfolio.

Investors with different levels of risk aversion will choose different portfolios. Highly risk-averse investors choose to invest most of their wealth in the risk-free asset and earn low returns because they are not willing to assume higher levels of risk. Less risk-averse investors, in contrast, invest more of their wealth in the risky asset, which is expected to yield a higher return. Obviously, the higher return cannot come without higher risk, but the less risk-averse investor is willing to accept the additional risk.

Combining a Risk-Free Asset with a Portfolio of Risky Assets

We can extend the analysis of one risky asset to a portfolio of risky assets. For convenience, assume that the portfolio contains all available risky assets (N), although an investor may not wish to include all of these assets in the portfolio because of the investor's specific preferences. If an asset is not included in the portfolio, its weight will be zero. The risk–return characteristics of a portfolio of N risky assets are given by the following equations:

$$E(R_p) = \sum_{i=1}^N w_i E(R_i)$$

$$\sigma_p^2 = \left(\sum_{i=1}^N \sum_{j=1}^N w_i w_j \text{Cov}(i,j) \right), \text{ and } \sum_{i=1}^N w_i = 1$$

The expected return on the portfolio, $E(R_p)$, is the weighted average of the expected returns of individual assets, where w_i is the fractional weight in asset i and R_i is the expected return of asset i . The risk of the portfolio (σ_p), however, depends on the weights of the individual assets, the risk of the individual assets, and their interrelationships. The **covariance** between assets i and j , $\text{Cov}(i,j)$, is a statistical measure of the interrelationship between each pair of assets in the portfolio and can be expressed as follows, where ρ_{ij} is the **correlation** between assets i and j and σ_i is the risk of asset i :

$$\text{Cov}(i,j) = \rho_{ij} \sigma_i \sigma_j$$

Note from the equation below that the correlation of an asset with itself is 1; therefore:

$$\text{Cov}(i,i) = \rho_{ii} \sigma_i \sigma_i = \sigma_i^2$$

By substituting the above expressions for covariance, we can rewrite the portfolio variance equation as

$$\sigma_p^2 = \left(\sum_{i=1}^N w_i^2 \sigma_i^2 + \sum_{i,j=1, i \neq j}^N w_i w_j \rho_{ij} \sigma_i \sigma_j \right)$$

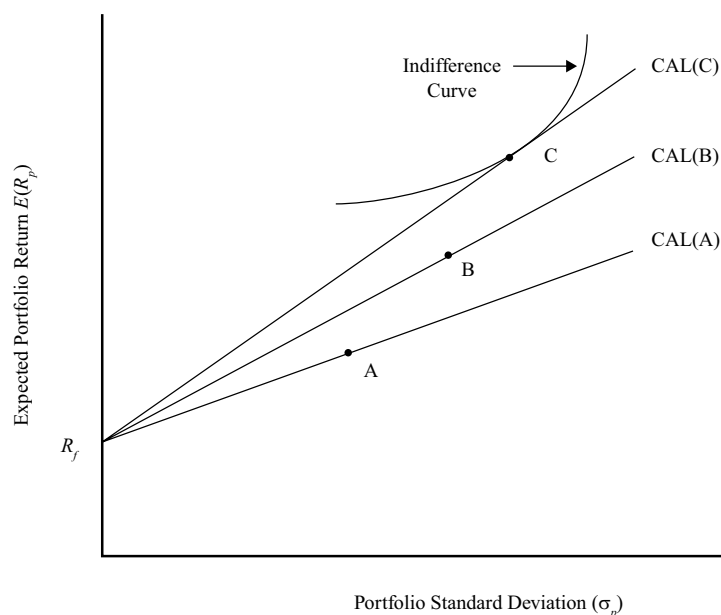
The suggestion that portfolios have lower risk than the assets they contain may seem counterintuitive. These portfolios can be constructed, however, as long as the assets in the portfolio are not perfectly correlated. As an illustration of the effect of asset weights on portfolio characteristics, consider a simple two-asset portfolio with zero weights in all other assets. Assume that Asset 1 has a return of 10 percent and a standard deviation (risk) of 20 percent. Asset 2 has a return of 5 percent and a standard deviation (risk) of 10 percent. Furthermore, the correlation between the two assets is zero. Exhibit 1 shows risks and returns for Portfolio X with a weight of 25 percent in Asset 1 and 75 percent in Asset 2, Portfolio Y with a weight of 50 percent in each of the two assets, and Portfolio Z with a weight of 75 percent in Asset 1 and 25 percent in Asset 2.

Exhibit 1: Portfolio Risk and Return

Portfolio	Weight in Asset 1 (%)	Weight in Asset 2 (%)	Portfolio Return (%)	Portfolio Standard Deviation (%)
X	25.0	75.0	6.25	9.01
Y	50.0	50.0	7.50	11.18
Z	75.0	25.0	8.75	15.21
Return	10.0	5.0		
Standard deviation	20.0	10.0		
Correlation between Assets 1 and 2		0.0		

From this example we observe that the three portfolios are quite different in terms of their risk and return. Portfolio X has a 6.25 percent return and only 9.01 percent standard deviation, whereas the standard deviation of Portfolio Z is more than two-thirds higher (15.21 percent), although the return is only slightly more than one-third higher (8.75 percent). These portfolios may become even more dissimilar as other assets are added to the mix.

Consider three portfolios of risky assets, A, B, and C, as in Exhibit 2, that may have been presented to a representative investor by three different investment advisers. Each portfolio is combined with the risk-free asset to create three capital allocation lines, CAL(A), CAL(B), and CAL(C). The exhibit shows that Portfolio C is superior to the other two portfolios because it has a greater expected return for any given level of risk. As a result, an investor will choose the portfolio that lies on the capital allocation line for Portfolio C. The combination of the risk-free asset and the risky Portfolio C that is selected for an investor depends on the investor's degree of risk aversion.

Exhibit 2: Risk-Free Asset and Portfolio of Risky Assets

Does a Unique Optimal Risky Portfolio Exist?

We assume that all investors have the same economic expectation and thus have the same expectations of prices, cash flows, and other investment characteristics. This assumption is referred to as **homogeneity of expectations**. Given these investment characteristics, everyone goes through the same calculations and should arrive at the same optimal risky portfolio. Therefore, assuming homogeneous expectations, only one optimal portfolio exists. If investors have different expectations, however, they might arrive at different optimal risky portfolios. To illustrate, we begin with an expression for the price of an asset:

$$P = \sum_{t=0}^T \frac{CF_t}{(1+r_t)^t}$$

where CF_t is the cash flow at the end of period t and r_t is the discount rate or the required rate of return for that asset for period t . Period t refers to all periods beginning from now until the asset ceases to exist at the end of time T . Because the current time is the end of period 0, which is the same as the beginning of period 1, there are $(T + 1)$ cash flows and $(T + 1)$ required rates of return. These conditions are based on the assumption that a cash flow, such as an initial investment, can occur now ($t = 0$). Ordinarily, however, CF_0 is zero.

We use the formula for the price of an asset to estimate the intrinsic value of an asset. Assume that the asset we are valuing is a share of Siemens AG which trades on Xetra. In the case of corporate stock, there is no expiration date, so T could be extremely large, meaning we will need to estimate a large number of cash flows and rates of return. Fortunately, the denominator reduces the importance of distant cash flows, so it may be sufficient to estimate, say, 20 annual cash flows and 20 rates of returns. How much will Siemens earn next year and the year after next? What will the product markets Siemens operates in look like in five years' time? Different analysts and investors will have their own estimates that may be quite different from one another. Also, as we delve further into the future, more serious issues in estimating future revenue, expenses, and growth rates arise. Therefore, to assume that cash flow estimates for Siemens will vary among these investors is reasonable. In addition to the numerator (cash flows), it is also necessary to estimate the denominator, the required rates of return. We know that riskier companies will require higher returns because risk and return are positively correlated. Siemens stock is riskier than a risk-free asset, but by how much? And what should the compensation for that additional risk be? Again, it is evident that different analysts will view the riskiness of Siemens differently and, therefore, arrive at different required rates of return.

Siemens closed at €111.84 on Xetra on 31 August 2018. The traded price represents the value that a marginal investor attaches to a share of Siemens, say, corresponding to Analyst A's expectation. Analyst B may think that the price should be €95, however, and Analyst C may think that the price should be €125. Given a price of €111.84, the expected returns of Siemens are quite different for the three analysts. Analyst B, who believes the price should be €95, concludes that Siemens is overvalued and may assign a weight of zero to Siemens in the recommended portfolio even though the market capitalization of Siemens was in excess of €100 billion as of the date of the quotation. In contrast, Analyst C, with a valuation of €125, thinks Siemens is undervalued and may significantly overweight Siemens in a portfolio.

Our discussion illustrates that analysts can arrive at different valuations that necessitate the assignment of different asset weights in a portfolio. Given the existence of many asset classes and numerous assets in each asset class, one can visualize that each investor will have his or her own optimal risky portfolio depending on his or her assumptions underlying the valuation computations. Therefore, market participants will have their own and possibly different optimal risky portfolios.

If investors have different valuations of assets, then the construction of a unique optimal risky portfolio is not possible. If we make a simplifying assumption of homogeneity in investor expectations, we will have a single optimal risky portfolio as previously mentioned. Even if investors have different expectations, market prices are a proxy of what the marginal, informed investor expects, and the market portfolio becomes the base case, the benchmark, or the reference portfolio that other portfolios can be judged against. For Siemens, the market price was €111.84 per share and the market capitalization was about €108 billion. In constructing the market portfolio, Siemens's weight in the market portfolio will be equal to its market value divided by the value of all other assets included in the market portfolio.

3

CAPITAL MARKET THEORY: THE CAPITAL MARKET LINE



explain the capital allocation line (CAL) and the capital market line (CML)

In the previous section, we discussed how the risk-free asset could be combined with a risky portfolio to create a capital allocation line (CAL). In this section, we discuss a specific CAL that uses the market portfolio as the optimal risky portfolio and is known as the capital market line. We also discuss the significance of the market portfolio and applications of the capital market line (CML).

Passive and Active Portfolios

In the above subsection, we hypothesized three possible valuations for each share of Siemens: €95, €111.84, and €125. Which one is correct?

If the market is an **informationally efficient market**, the price in the market, €111.84, is an unbiased estimate of all future discounted cash flows (recall the formula for the price of an asset). In other words, the price aggregates and reflects all information that is publicly available, and investors cannot expect to earn a return that is greater than the required rate of return for that asset. If, however, the price reflects all publicly available information and there is no way to outperform the market, then there is little point in investing time and money in evaluating Siemens to arrive at your price using your own estimates of cash flows and rates of return.

In that case, a simple and convenient approach to investing is to rely on the prices set by the market. Portfolios that are based on the assumption of unbiased market prices are referred to as passive portfolios. Passive portfolios most commonly replicate and track market indexes, which are passively constructed on the basis of market prices and market capitalizations. Examples of market indexes are the S&P 500 Index, the Nikkei 300, and the CAC 40. Passive portfolios based on market indexes are called index funds and generally have low costs because no significant effort is expended in valuing securities that are included in an index.

In contrast to passive investors' reliance on market prices and index funds, active investors may not rely on market valuations. They have more confidence in their own ability to estimate cash flows, growth rates, and discount rates. Based on these estimates, they value assets and determine whether an asset is fairly valued. In an actively managed portfolio, assets that are undervalued, or have a chance of offering above-normal returns, will have a positive weight (i.e., overweight compared to the market weight in the benchmark index), whereas other assets will have a zero weight,

or even a negative weight if short selling is permitted (i.e., some assets will be under-weighted compared with the market weight in the benchmark index). (**Short selling** is a transaction in which borrowed securities are sold with the intention to repurchase them at a lower price at a later date and return them to the lender.) This style of investing is called active investment management, and the portfolios are referred to as active portfolios. Most open-end mutual funds and hedge funds practice active investment management, and most analysts believe that active investing adds value. Whether these analysts are right or wrong is the subject of continuing debate.

What Is the “Market”?

In the previous discussion, we referred to the “market” on numerous occasions without actually defining the market. The optimal risky portfolio and the capital market line depend on the definition of the market. So what is the market?

Theoretically, the market includes all risky assets or anything that has value, which includes stocks, bonds, real estate, and even human capital. Not all assets are tradable, however, and not all tradable assets are investable. For example, the Taj Mahal in India is an asset but is not a tradable asset. Similarly, human capital is an asset that is not tradable. Moreover, assets may be tradable but not investable because of restrictions placed on certain kinds of investors. For example, all stocks listed on the Shanghai Stock Exchange are tradable. However, whereas Class A shares are listed in RMB and open to domestic investors and qualified foreign investors, Class B shares are listed in USD and open to foreign investors and domestic investors holding foreign currency dealing accounts.

If we consider all stocks, bonds, real estate assets, commodities, etc., probably hundreds of thousands of assets are tradable and investable. The “market” should contain as many assets as possible; we emphasize the word “possible” because it is not practical to include all assets in a single risky portfolio. Even though advancements in technology and interconnected markets have made it much easier to span the major equity markets, we are still not able to easily invest in other kinds of assets like bonds and real estate except in the most developed countries.

For the rest of this reading, we will define the “market” quite narrowly because it is practical and convenient to do so. Typically, a local or regional stock market index is used as a proxy for the market because of active trading in stocks and because a local or regional market is most visible to the local investors. For our purposes, we will use the S&P 500 Index as the market’s proxy. The S&P 500 is commonly used by analysts as a benchmark for market performance throughout the United States. It contains 500 of the largest stocks that are domiciled in the United States, and these stocks are weighted by their market capitalization (price times the number of outstanding shares).

As of mid-2018, the stocks in the S&P 500 account for approximately 80 percent of the total equity market capitalization in the United States, and because the US stock markets represent about 40 percent of the world markets, the S&P 500 represents roughly 32 percent of worldwide publicly traded equity. Our definition of the market does not include non-US stock markets, bond markets, real estate, and many other asset classes, and therefore, “market” return and the “market” risk premium refer to US equity return and the US equity risk premium, respectively. The use of this proxy, however, is sufficient for our discussion, and is relatively easy to expand to include other tradable assets.

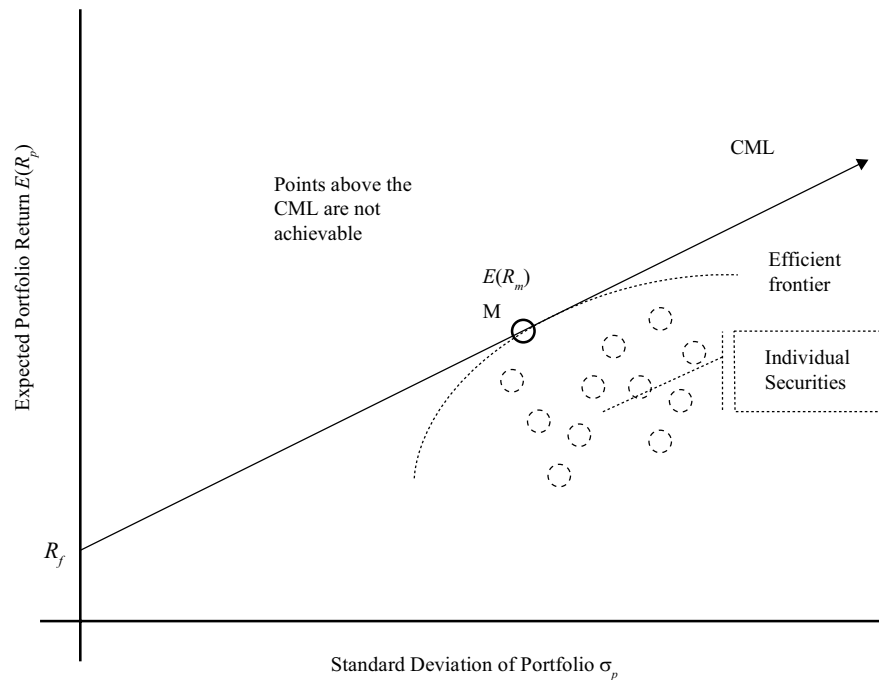
The Capital Market Line (CML)

A capital allocation line includes all possible combinations of the risk-free asset and an investor’s optimal risky portfolio. The **capital market line** is a special case of the capital allocation line, where the risky portfolio is the market portfolio. The risk-free

asset is a debt security with no default risk, no inflation risk, no liquidity risk, no interest rate risk, and no risk of any other kind. US Treasury bills are usually used as a proxy of the risk-free return, R_f .

The S&P 500 is a proxy of the market portfolio, which is the optimal risky portfolio. Therefore, the expected return on the risky portfolio is the expected market return, expressed as $E(R_m)$. The capital market line is shown in Exhibit 3, where the standard deviation (σ_p), or total risk, is on the x -axis and expected portfolio return, $E(R_p)$, is on the y -axis. Graphically, the market portfolio is the point on the Markowitz efficient frontier where a line from the risk-free asset is tangent to the Markowitz efficient frontier. All points on the interior of the Markowitz efficient frontier are inefficient portfolios in that they provide the same level of return with a higher level of risk or a lower level of return with the same amount of risk. When plotted together, the point at which the CML is tangent to the Markowitz efficient frontier is the optimal combination of risky assets, on the basis of market prices and market capitalizations. The optimal risky portfolio is the market portfolio.

Exhibit 3: Capital Market Line



The CML's intercept on the y -axis is the risk-free return (R_f) because that is the return associated with zero risk. The CML passes through the point represented by the market return, $E(R_m)$. With respect to capital market theory, any point above the CML is not achievable and any point below the CML is dominated by and inferior to any point on the CML.

Note that we identify the CML and CAL as lines even though they are a combination of two assets. Unlike a combination of two risky assets, which is usually not a straight line, a combination of the risk-free asset and a risky portfolio is a straight line, as illustrated below by computing the combination's risk and return.

Risk and return characteristics of the portfolio represented by the CML can be computed by using the return and risk expressions for a two-asset portfolio:

$$E(R_p) = w_1 R_f + (1 - w_1) E(R_m),$$

and

$$\sigma_p = \sqrt{w_1^2 \sigma_f^2 + (1 - w_1)^2 \sigma_m^2 + 2 w_1 (1 - w_1) \text{Cov}(R_f, R_m)}$$

The proportion invested in the risk-free asset is given by w_1 , and the balance is invested in the market portfolio, $(1 - w_1)$. The risk of the risk-free asset is given by σ_f , the risk of the market is given by σ_m , the risk of the portfolio is given by σ_p , and the covariance between the risk-free asset and the market portfolio is represented by $\text{Cov}(R_f, R_m)$.

By definition, the standard deviation of the risk-free asset is zero. Because its risk is zero, the risk-free asset does not co-vary or move with any other asset. Therefore, its covariance with all other assets, including the market portfolio, is zero, making the first and third terms under the square root sign zero. As a result, the portfolio return and portfolio standard deviation can be simplified and rewritten as:

$$E(R_p) = w_1 R_f + (1 - w_1) E(R_m),$$

and

$$\sigma_p = (1 - w_1) \sigma_m$$

By substitution, we can express $E(R_p)$ in terms of σ_p . Substituting for w_1 , we get:

$$E(R_p) = R_f + \left(\frac{E(R_m) - R_f}{\sigma_m} \right) \times \sigma_p$$

Note that the expression is in the form of a line, $y = a + bx$. The y -intercept is the risk-free rate, and the slope of the line referred to as the market price of risk is $[E(R_m) - R_f]/\sigma_m$. The CML has a positive slope because the market's risky return is larger than the risk-free return. As the amount of the total investment devoted to the market increases—that is, as we move up the line—both standard deviation (risk) and expected return increase.

EXAMPLE 1

Risk and Return on the CML

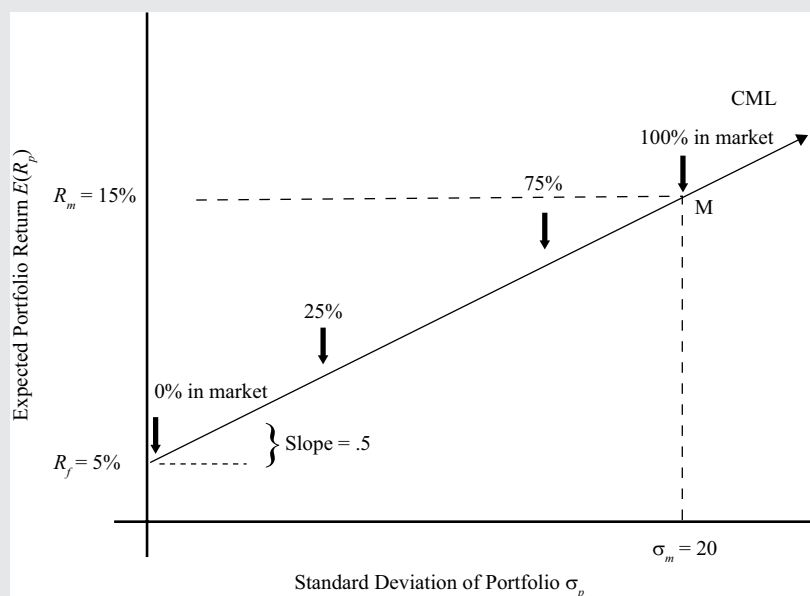
Mr. Miles is a first time investor and wants to build a portfolio using only US T-bills and an index fund that closely tracks the S&P 500 Index. The T-bills have a return of 5 percent. The S&P 500 has a standard deviation of 20 percent and an expected return of 15 percent.

1. Draw the CML and mark the points where the investment in the market is 0 percent, 25 percent, 75 percent, and 100 percent.

Solution:

We calculate the equation for the CML as $E(R_p) = 5\% + 0.50 \times \sigma_p$ by substituting the given information into the general CML equation. The intercept of the line is 5 percent, and its slope is 0.50. We can draw the CML by arbitrarily taking any two points on the line that satisfy the above equation.

Alternatively, the CML can be drawn by connecting the risk-free return of 5 percent on the y -axis with the market portfolio at (20 percent, 15 percent). The CML is shown in Exhibit 4.

Exhibit 4: Risk and Return on the CML

2. Mr. Miles is also interested in determining the exact risk and return at each point.

Solution:

Return with 0 percent invested in the market
= 5 percent, which is the risk-free return.

Standard deviation with 0 percent invested in the market
= 0 percent because T-bills are not risky.

Return with 25 percent invested in the market = $(0.75 \times 5\%) + (0.25 \times 15\%)$
= 7.5%.

Standard deviation with 25 percent invested in the market = $0.25 \times 20\% = 5\%$.

Return with 75 percent invested in the market = $(0.25 \times 5\%) + (0.75 \times 15\%)$
= 12.50%.

Standard deviation with 75 percent invested in the market = $0.75 \times 20\% = 15\%$.

Return with 100 percent invested in the market
= 15 percent, which is the return on the S&P 500.

Standard deviation with 100 percent invested in the market
= 20 percent, which is the risk of the S&P 500.

CAPITAL MARKET THEORY: CML - LEVERAGED PORTFOLIOS

4

- ☐ explain the capital allocation line (CAL) and the capital market line (CML)

In the previous example, Mr. Miles evaluated an investment of between 0 percent and 100 percent in the market and the balance in T-bills. The line connecting R_f and M (market portfolio) in Exhibit 4 illustrates these portfolios with their respective levels of investment. At R_f , an investor is investing all of his or her wealth into risk-free securities, which is equivalent to lending 100 percent at the risk-free rate. At Point M he or she is holding the market portfolio and not lending any money at the risk-free rate. The combinations of the risk-free asset and the market portfolio, which may be achieved by the points between these two limits, are termed “lending” portfolios. In effect, the investor is lending part of his or her wealth at the risk-free rate.

If Mr. Miles is willing to take more risk, he may be able to move to the right of the market portfolio (Point M in Exhibit 4) by borrowing money and purchasing more of Portfolio M . Assume that he is able to borrow money at the same risk-free rate of interest, R_f , at which he can invest. He can then supplement his available wealth with borrowed money and construct a borrowing portfolio. If the straight line joining R_f and M is extended to the right of Point M , this extended section of the line represents borrowing portfolios. As one moves further to the right of Point M , an increasing amount of borrowed money is being invested in the market. This means that there is *negative* investment in the risk-free asset, which is referred to as a *leveraged position* in the risky portfolio. The particular point chosen on the CML will depend on the individual’s utility function, which, in turn, will be determined by his risk and return preferences.

EXAMPLE 2

Risk and Return of a Leveraged Portfolio with Equal Lending and Borrowing Rates

1. Mr. Miles decides to set aside a small part of his wealth for investment in a portfolio that has greater risk than his previous investments because he anticipates that the overall market will generate attractive returns in the future. He assumes that he can borrow money at 5 percent and achieve the same return on the S&P 500 as before: an expected return of 15 percent with a standard deviation of 20 percent.

Calculate his expected risk and return if he borrows 25 percent, 50 percent, and 100 percent of his initial investment amount.

Solution:

The leveraged portfolio’s standard deviation and return can be calculated in the same manner as before with the following equations:

$$E(R_p) = w_1 R_f + (1 - w_1) E(R_m)$$

and

$$\sigma_p = (1 - w_1)\sigma_m$$

The proportion invested in T-bills becomes negative instead of positive because Mr. Miles is borrowing money. If 25 percent of the initial investment is borrowed, $w_1 = -0.25$, and $(1 - w_1) = 1.25$, etc.

Return with $w_1 = -0.25 = (-0.25 \times 5\%) + (1.25 \times 15\%) = 17.5\%$.

Standard deviation with $w_1 = -0.25 = 1.25 \times 20\% = 25\%$.

Return with $w_1 = -0.50 = (-0.50 \times 5\%) + (1.50 \times 15\%) = 20.0\%$.

Standard deviation with $w_1 = -0.50 = 1.50 \times 20\% = 30\%$.

Return with $w_1 = -1.00 = (-1.00 \times 5\%) + (2.00 \times 15\%) = 25.0\%$.

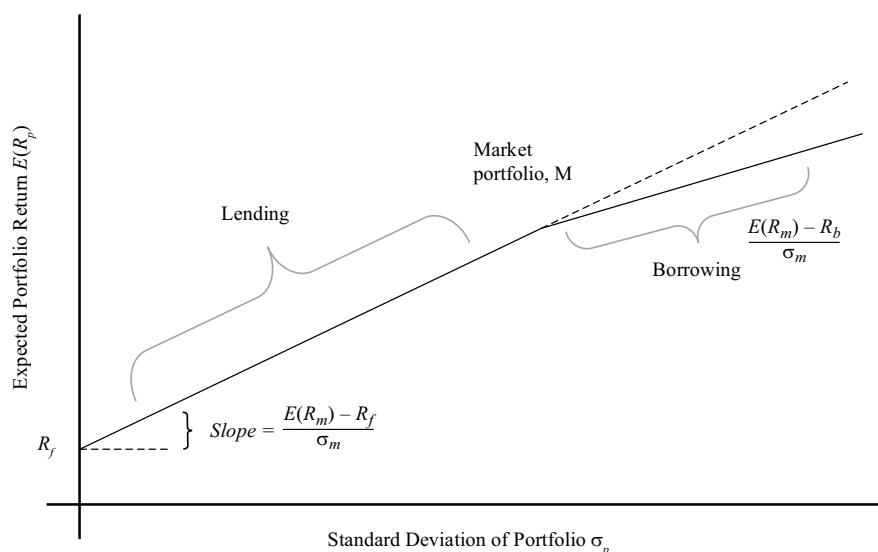
Standard deviation with $w_1 = -1.00 = 2.00 \times 20\% = 40\%$.

Note that negative investment (borrowing) in the risk-free asset provides a higher expected return for the portfolio but that higher return is also associated with higher risk.

Leveraged Portfolios with Different Lending and Borrowing Rates

Although we assumed that Mr. Miles can borrow at the same rate as the US government, it is more likely that he will have to pay a higher interest rate than the government because his ability to repay is not as certain as that of the government. Now consider that although Mr. Miles can invest (lend) at R_f he can borrow at only R_b , a rate that is higher than the risk-free rate.

With different lending and borrowing rates, the CML will no longer be a single straight line. The line will have a slope of $[E(R_m) - R_f]/\sigma_m$ between Points R_f and M , where the lending rate is R_f but will have a smaller slope of $[E(R_m) - R_b]/\sigma_m$ at points to the right of M , where the borrowing rate is R_b . Exhibit 5 illustrates the CML with different lending and borrowing rates.

Exhibit 5: CML with Different Lending and Borrowing Rates

The equations for the two lines are given below.

$$w_1 \geq 0: E(R_p) = R_f + \left(\frac{E(R_m) - R_f}{\sigma_m} \right) \times \sigma_p$$

and

$$w_1 < 0: E(R_p) = R_b + \left(\frac{E(R_m) - R_b}{\sigma_m} \right) \times \sigma_p$$

The first equation is for the line where the investment in the risk-free asset is zero or positive—that is, at M or to the left of M in Exhibit 5. The second equation is for the line where borrowing, or negative investment in the risk-free asset, occurs. Note that the only difference between the two equations is in the interest rates used for borrowing and lending.

All passive portfolios will lie on the kinked CML, although the investment in the risk-free asset may be positive (lending), zero (no lending or borrowing), or negative (borrowing). Leverage allows less risk-averse investors to increase the amount of risk they take by borrowing money and investing more than 100 percent in the passive portfolio.

EXAMPLE 3

Leveraged Portfolio with Different Lending and Borrowing Rates

1. Mr. Miles approaches his broker to borrow money against securities held in his portfolio. Even though Mr. Miles' loan will be secured by the securities in his portfolio, the broker's rate for lending to customers is 7 percent. Assuming a risk-free rate of 5 percent and a market return of 15 percent with a standard deviation of 20 percent, estimate Mr. Miles' expected return and risk if he invests 25 percent and 75 percent in the market and if he decides

to borrow 25 percent and 75 percent of his initial investment and invest the money in the market.

Solution:

The unleveraged portfolio's standard deviation and return are calculated using the same equations as before:

$$E(R_p) = w_1 R_f + (1 - w_1)E(R_m),$$

and

$$\sigma_p = (1 - w_1)\sigma_m$$

The results are unchanged. The slope of the line for the unleveraged portfolio is 0.50, just as before:

$$\begin{aligned} \text{Return with 25 percent invested in the market} &= (0.75 \times 5\%) + (0.25 \times 15\%) \\ &= 7.5\%. \end{aligned}$$

$$\text{Standard deviation with 25 percent invested in the market} = 0.25 \times 20\% = 5\%.$$

$$\begin{aligned} \text{Return with 75 percent invested in the market} &= (0.25 \times 5\%) + (0.75 \times 15\%) \\ &= 12.5\%. \end{aligned}$$

$$\text{Standard deviation with 75 percent invested in the market} = 0.75 \times 20\% = 15\%.$$

For the leveraged portfolio, everything remains the same except that R_f is replaced with R_b .

$$E(R_p) = w_1 R_b + (1 - w_1)E(R_m),$$

and

$$\sigma_p = (1 - w_1)\sigma_m.$$

$$\text{Return with } w_1 = -0.25 = (-0.25 \times 7\%) + (1.25 \times 15\%) = 17.0\%.$$

$$\text{Standard deviation with } w_1 = -0.25 = 1.25 \times 20\% = 25\%.$$

$$\text{Return with } w_1 = -0.75 = (-0.75 \times 7\%) + (1.75 \times 15\%) = 21.0\%.$$

$$\text{Standard deviation with } w_1 = -0.75 = 1.75 \times 20\% = 35\%.$$

The risk and return of the leveraged portfolio is higher than that of the unleveraged portfolio. As Mr. Miles borrows more money to invest in the market, the expected return increases but so does the standard deviation of the portfolio. The slope of the line for the leveraged portfolio is 0.40, compared with 0.50 for the unleveraged portfolio, which means that for every 1 percent increase in risk, the investor gets a 0.40 percent increase in expected return in the leveraged part of the portfolio, compared with a 0.50 percent increase in expected return in the unleveraged part of the portfolio. Only investors who are less risk averse will choose leveraged portfolios.

SYSTEMATIC AND NONSYSTEMATIC RISK

5



explain systematic and nonsystematic risk, including why an investor should not expect to receive additional return for bearing nonsystematic risk

In constructing a portfolio, it is important to understand the concept of correlation and how less than perfect correlation can diversify the risk of a portfolio. As a consequence, the risk of an asset held alone may be greater than the risk of that same asset when it is part of a portfolio. Because the risk of an asset varies from one environment to another, which kind of risk should an investor consider and how should that risk be priced? This section addresses the question of pricing of risk by decomposing the total risk of a security or a portfolio into systematic and nonsystematic risk. The meaning of these risks, how they are computed, and their relevance to the pricing of assets are also discussed.

Systematic Risk and Nonsystematic Risk

Systematic risk, also known as non-diversifiable or market risk, is the risk that affects the entire market or economy. In contrast, nonsystematic risk is the risk that pertains to a single company or industry and is also known as company-specific, industry-specific, diversifiable, or idiosyncratic risk.

Systematic risk is risk that cannot be avoided and is inherent in the overall market. It is non-diversifiable because it includes risk factors that are innate within the market and affect the market as a whole. Examples of factors that constitute systematic risk include interest rates, inflation, economic cycles, political uncertainty, and widespread natural disasters. These events affect the entire market, and there is no way to avoid their effect. Systematic risk can be magnified through selection or by using leverage, or diminished by including securities that have a low correlation with the portfolio, assuming they are not already part of the portfolio.

Nonsystematic risk is risk that is local or limited to a particular asset or industry that need not affect assets outside of that asset class. Examples of nonsystematic risk could include the failure of a drug trial or an airliner crash. All these events will directly affect their respective companies and possibly industries, but have no effect on assets that are far removed from these industries. Investors can avoid nonsystematic risk through diversification by forming a portfolio of assets that are not highly correlated with one another.

We will derive expressions for each kind of risk later in this reading. You will see that the sum of systematic variance and nonsystematic variance equals the total variance of the security or portfolio:

$$\text{Total variance} = \text{Systematic variance} + \text{Nonsystematic variance}$$

Although the equality relationship is between variances, you will find frequent references to total risk as the sum of systematic risk and nonsystematic risk. In those cases, the statements refer to variance, not standard deviation.

Pricing of Risk

Pricing or valuing an asset is equivalent to estimating its expected rate of return. If an asset has a known terminal value, such as the face value of a bond, then a lower current price implies a higher future return and a higher current price implies a lower

future return. The relationship between price and return can also be observed in the valuation expression shown in Section 2.1.2. Therefore, we will occasionally use price and return interchangeably when discussing the price of risk.

Consider an asset with both systematic and nonsystematic risk. Assume that both kinds of risk are priced—that is, you receive a return for both systematic risk and nonsystematic risk. What will you do? Realizing that nonsystematic risk can be diversified away, you would buy assets that have a large amount of nonsystematic risk. Once you have bought those assets with nonsystematic risk, you would diversify, or reduce that risk, by including other assets that are not highly correlated. In the process, you will minimize nonsystematic risk and eventually eliminate it altogether from your portfolio. You would now have a diversified portfolio with only systematic risk, yet you would be compensated for nonsystematic risk that you no longer have. Just like everyone else, you would have an incentive to take on more and more diversifiable risk because you are compensated for it even though you can get rid of it. The demand for diversifiable risk would keep increasing until its price becomes infinite and its expected return falls to zero. This means that our initial assumption of a non-zero return for diversifiable risk was incorrect and that the correct assumption is zero return for diversifiable risk. Therefore, according to theory, in an efficient market no incremental reward is earned for taking on diversifiable risk.

We have argued that investors should not be compensated for taking on nonsystematic risk. Therefore, investors who have nonsystematic risk must diversify it away by investing in many industries, many countries, and many asset classes. Because future returns are unknown and it is not possible to pick only winners, diversification helps in offsetting poor returns in one asset class by garnering good returns in another asset class, thereby reducing the overall risk of the portfolio. In contrast, investors must be compensated for accepting systematic risk because that risk cannot be diversified away. If investors do not receive a return commensurate with the amount of systematic risk they are taking, they will refuse to accept systematic risk.

In summary, according to theory, systematic or non-diversifiable risk is priced and investors are compensated for holding assets or portfolios based only on that investment's systematic risk. Investors do not receive any return for accepting nonsystematic or diversifiable risk. Therefore, it is in the interest of risk-averse investors to hold only well-diversified portfolios.

EXAMPLE 4

Systematic and Nonsystematic Risk

1. Describe the systematic and nonsystematic risk components of the following assets:
 - A. A risk-free asset, such as a three-month Treasury bill
 - B. The market portfolio, such as the S&P 500.
2. Consider two assets, A and B. Asset A has twice the amount of total risk as Asset B. For Asset A, systematic risk comprises two-thirds of total risk. For Asset B, all of total risk is systematic risk. Which asset should have a higher expected rate of return?

Solution to 1A:

By definition, a risk-free asset has no risk. Therefore, a risk-free asset has zero systematic risk and zero nonsystematic risk.

Solution to 1B:

As we mentioned earlier, a market portfolio is a diversified portfolio, one in which no more risk can be diversified away. We have also described it as an efficient portfolio. Therefore, a market portfolio does not contain any nonsystematic risk.

Solution to 2:

Based on the facts given, Asset A's systematic risk is one-third greater than Asset B's systematic risk. Because only systematic risk is priced or receives a return, the expected rate of return must be higher for Asset A.

RETURN GENERATING MODELS**6**

explain return generating models (including the market model) and their uses

As previously mentioned, in order to form the market portfolio, you should combine all available risky assets. Knowledge of the correlations among those assets allows us to estimate portfolio risk. You also learned that a fully diversified portfolio will include all asset classes and essentially all assets in those asset classes. The work required for construction of the market portfolio is formidable. For example, for a portfolio of 1,000 assets, we will need 1,000 return estimates, 1,000 standard deviation estimates, and 499,500 ($1,000 \times 999 \div 2$) correlations. Other related questions that arise with this analysis are whether we really need all 1,000 assets and what happens if there are errors in these estimates.

An alternate method of constructing an optimal portfolio is simpler and easier to implement. An investor begins with a known portfolio, such as the S&P 500, and then adds other assets one at a time on the basis of the asset's standard deviation, expected return, and impact on the portfolio's risk and return. This process continues until the addition of another asset does not have a significant impact on the performance of the portfolio. The process requires only estimates of systematic risk for each asset because investors will not be compensated for nonsystematic risk. Expected returns can be calculated by using return-generating models, as we will discuss in this section. In addition to using return-generating models, we will also decompose total variance into systematic variance and nonsystematic variance and establish a formal relationship between systematic risk and return. In the next section, we will expand on this discussion and introduce the CAPM as the preferred return-generating model.

Return-Generating Models

A **return-generating model** is a model that can provide an estimate of the expected return of a security given certain parameters. If systematic risk is the only relevant parameter for return, then the return-generating model will estimate the expected return for any asset given the level of systematic risk.

As with any model, the quality of estimates of expected return will depend on the quality of input estimates and the accuracy of the model. Because it is difficult to decide which factors are appropriate for generating returns, the most general form of a return-generating model is a multi-factor model. A **multi-factor model** allows more than one variable to be considered in estimating returns and can be built using different kinds of factors, such as macroeconomic, fundamental, and statistical factors.

Macroeconomic factor models use economic factors that are correlated with security returns. These factors may include economic growth, the interest rate, the inflation rate, productivity, employment, and consumer confidence. Past relationships with returns are estimated to obtain parameter estimates, which are, in turn, used for computing expected returns. Fundamental factor models analyze and use relationships between security returns and the company's underlying fundamentals, such as, for example, earnings, earnings growth, cash flow generation, investment in research, advertising, and number of patents. Finally, in a statistical factor model, historical and cross-sectional return data are analyzed to identify factors that explain variance or covariance in observed returns. These statistical factors, however, may or may not have an economic or fundamental connection to returns. For example, the conference to which the American football Super Bowl winner belongs, whether the American Football Conference or the National Football Conference, may be a factor in US stock returns, but no obvious economic connection seems to exist between the winner's conference and US stock returns. Moreover, data mining may generate many spurious factors that are devoid of any economic meaning. Because of this limitation, analysts prefer the macroeconomic and fundamental factor models for specifying and estimating return-generating models.

A general return-generating model is expressed in the following manner:

$$E(R_i) - R_f = \sum_{j=1}^k \beta_{ij} E(F_j) = \beta_{i1} [E(R_m) - R_f] + \sum_{j=2}^k \beta_{ij} E(F_j)$$

The model has k factors, $E(F_1)$, $E(F_2)$, ... $E(F_k)$. The coefficients, β_{ij} , are the factor weights (sometimes called factor loadings) associated with each factor. The left-hand side of the model has the expected excess return (i.e., the expected return over the risk-free rate). The right-hand side provides the risk factors that would generate the return or premium required to assume that risk. We have separated out one factor, $E(R_m)$, which represents the market return. All models contain return on the market portfolio as a key factor.

Three-Factor and Four-Factor Models

Eugene Fama and Kenneth French¹ suggested that a return-generating model for stock returns should include relative market capitalization of the company ("size") relative book-to-market value of the company in addition to beta. Fama and French found that past returns could be explained better with their model than with other models available at that time, most notably, the capital asset pricing model. Mark Carhart (1997) extended the Fama and French model by adding another factor: momentum, defined as relative past stock returns.

The Single-Index Model

The simplest form of a return-generating model is a single-factor linear model, in which only one factor is considered. The most common implementation is a single-index model, which uses the market factor in the following form: $E(R_i) - R_f = \beta_i [E(R_m) - R_f]$.

Although the single-index model is simple, it fits nicely with the capital market line. Recall that the CML is linear, with an intercept of R_f and a slope of $[E(R_m) - R_f]/\sigma_m$. We can rewrite the CML by moving the intercept to the left-hand side of the equation, rearranging the terms, and generalizing the subscript from p to i , for any security:

$$E(R_i) - R_f = \left(\frac{\sigma_i}{\sigma_m} \right) [E(R_m) - R_f]$$

¹ Fama and French (1992).

The factor loading or factor weight, σ_i/σ_m , refers to the ratio of total security risk to total market risk. To obtain a better understanding of factor loading and to illustrate that the CML reduces to a single-index model, we decompose total risk into its components.

Decomposition of Total Risk for a Single-Index Model

With the introduction of return-generating models, particularly the single-index model, we are able to decompose total variance into systematic and nonsystematic variances. Instead of using expected returns in the single index, let us use realized returns. The difference between expected returns and realized returns is attributable to non-market changes, as an error term, e_i , in the second equation below:

$$E(R_i) - R_f = \beta_i[E(R_m) - R_f]$$

and

$$R_i - R_f = \beta_i(R_m - R_f) + e_i$$

The variance of realized returns can be expressed in the equation below (note that R_f is a constant). We can further drop the covariance term in this equation because, by definition, any non-market return is uncorrelated with the market. Thus, we are able to decompose total variance into systematic and nonsystematic variances in the second equation below:

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_e^2 + 2Cov(R_m, e_i)$$

Total variance = Systematic variance + Nonsystematic variance, which can be written as

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_e^2$$

Total risk can be expressed as

$$\sigma_i = \sqrt{\beta_i^2 \sigma_m^2 + \sigma_e^2}$$

Because nonsystematic risk is zero for well-diversified portfolios, such as the market portfolio, the total risk of a market portfolio and other similar portfolios is only systematic risk, which is $\beta_i \sigma_m$. We can now return to the CML discussed in the previous subsection and replace σ_i with $\beta_i \sigma_m$ because the CML assumes that the market is a diversified portfolio. By making this substitution for the above equation, we get the following single-index model:

$$E(R_i) - R_f = \left(\frac{\sigma_i}{\sigma_m}\right) \times [E(R_m) - R_f] = \left(\frac{\beta_i \sigma_m}{\sigma_m}\right) \times [E(R_m) - R_f],$$

$$E(R_i) - R_f = \beta_i[E(R_m) - R_f]$$

Thus, the CML, which holds only for well-diversified portfolios, is fully consistent with a single-index model.

In summary, total variance may be decomposed into systematic and nonsystematic variances and the CML is the same as a single-index model for diversified portfolios.

Return-Generating Models: The Market Model

The most common implementation of a single-index model is the **market model**, in which the market return is the single factor or single index. In principle, the market model and the single-index model are similar. The difference is that the market model is easier to work with and is normally used for estimating beta risk and computing abnormal returns. The market model is

$$R_i = \alpha_i + \beta_i R_m + e_i$$

To be consistent with the previous section, $\alpha_i = R_f(1 - \beta_i)$. The intercept, α_i , and slope coefficient, β_i , can be estimated by using historical security and market returns. These parameter estimates are then used to predict company-specific returns that a security may earn in a future period. Assume that a regression of Wal-Mart's historical daily returns on S&P 500 daily returns gives an α_i of 0.0001 and a β_i of 0.9. Thus, Wal-Mart's expected daily return = $0.0001 + 0.90 \times R_m$. If, on a given day the market rises by 1 percent and Wal-Mart's stock rises by 2 percent, then Wal-Mart's company-specific return (e_i) for that day = $R_i - E(R_i) = R_i - (\alpha_i + \beta_i R_m) = 0.02 - (0.0001 + 0.90 \times 0.01) = 0.0109$, or 1.09%. In other words, Wal-Mart earned an abnormal return of 1.09 percent on that day.

7

CALCULATION AND INTERPRETATION OF BETA



calculate and interpret beta

We begin with the single-index model introduced earlier using realized returns and rewrite it as

$$R_i = (1 - \beta_i)R_f + \beta_i \times R_m + e_i$$

Because systematic risk depends on the correlation between the asset and the market, we can arrive at a measure of systematic risk from the covariance between R_i and R_m , where R_i is defined using the above equation. Note that the risk-free rate is a constant, so the first term in R_i drops out.

$$\begin{aligned} \text{Cov}(R_i, R_m) &= \text{Cov}(\beta_i \times R_m + e_i, R_m) \\ &= \beta_i \text{Cov}(R_m, R_m) + \text{Cov}(e_i, R_m) \\ &= \beta_i \sigma_m^2 + 0 \end{aligned}$$

The first term is beta multiplied by the variance of R_m . Because the error term is uncorrelated with the market, the second term drops out. Then, we can rewrite the equation in terms of beta as follows:

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\sigma_m^2} = \frac{\rho_{i,m} \sigma_i \sigma_m}{\sigma_m^2} = \frac{\rho_{i,m} \sigma_i}{\sigma_m}$$

The above formula shows the expression for beta, β_i , which is similar to the factor loading in the single-index model presented earlier. For example, if the correlation between an asset and the market is 0.70 and the asset and market have standard deviations of return of 0.25 and 0.15, respectively, the asset's beta would be $(0.70)(0.25)/0.15 = 1.17$. If the asset's covariance with the market and market variance were given as 0.026250 and 0.02250, respectively, the calculation would be $0.026250/0.02250 = 1.17$. The beta in the market model includes an adjustment for the correlation between asset i and the market because the market model covers all assets whereas the CML works only for fully diversified portfolios.

As shown in the above equation, **beta** is a measure of how sensitive an asset's return is to the market as a whole and is calculated as the covariance of the return on i and the return on the market divided by the variance of the market return; that expression is equivalent to the product of the asset's correlation with the market with a ratio of standard deviations of return (i.e., the ratio of the asset's standard deviation to the market's). As we have shown, beta captures an asset's systematic risk, or the portion of an asset's risk that cannot be eliminated by diversification. The variances and correlations required for the calculation of beta are usually based on historical returns.

A positive beta indicates that the return of an asset follows the general market trend, whereas a negative beta shows that the return of an asset generally follows a trend that is opposite to that of the market. In other words, a positive beta indicates that the return of an asset moves in the same direction of the market, whereas a negative beta indicates that the return of an asset moves in the opposite direction of the market. A risk-free asset's beta is zero because its covariance with other assets is zero. In other words, a beta of zero indicates that the asset's return has no correlation with movements in the market. The market's beta can be calculated by substituting σ_m for σ_i in the numerator. Also, any asset's correlation with itself is 1, so the beta of the market is 1:

$$\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m} = \frac{\rho_{m,m}\sigma_m}{\sigma_m} = 1$$

Because the market's beta is 1, the average beta of stocks in the market, by definition, is 1. In terms of correlation, most stocks, especially in developed markets, tend to be highly correlated with the market, with correlations in excess of 0.70. Some US broad market indexes, such as the S&P 500, the Dow Jones 30, and the NASDAQ 100, have even higher correlations that are in excess of 0.90. The correlations among different sectors are also high, which shows that companies have similar reactions to the same economic and market changes. As a consequence and as a practical matter, finding assets that have a consistently negative beta is unusual because of the market's broad effects on all assets.

EXAMPLE 5

Calculation of Beta

Assuming that the risk (standard deviation) of the market is 25 percent, calculate the beta for the following assets:

We use the formula for beta in answering the above questions: $\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m}$

1. A short-term US Treasury bill.

Solution:

By definition, a short-term US Treasury bill has zero risk. Therefore, its beta is zero.

2. Gold, which has a standard deviation equal to the standard deviation of the market but a zero correlation with the market.

Solution:

Because the correlation of gold with the market is zero, its beta is zero.

3. A new emerging market that is not currently included in the definition of "market"—the emerging market's standard deviation is 60 percent, and the correlation with the market is -0.1 .

Solution:

Beta of the emerging market is $-0.1 \times 0.60 \div 0.25 = -0.24$.

4. An initial public offering or new issue of stock with a standard deviation of 40 percent and a correlation with the market of 0.7 (IPOs are usually very risky but have a relatively low correlation with the market).

Solution:

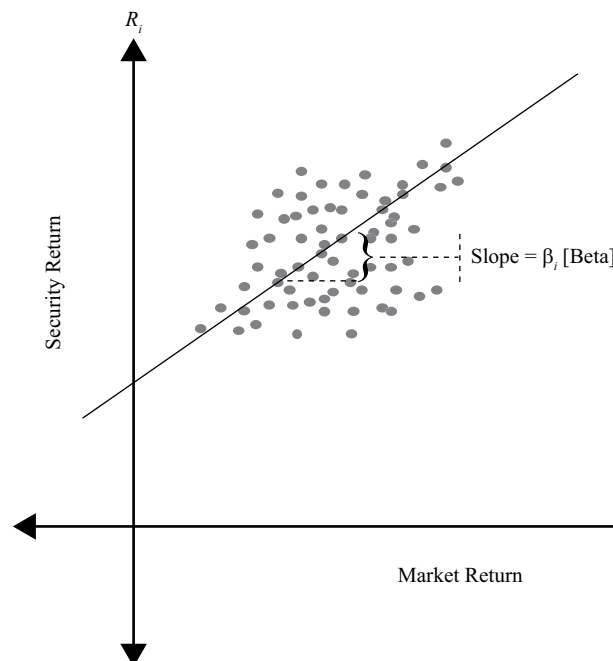
Beta of the initial public offering is $0.7 \times 0.40 \div 0.25 = 1.12$.

Estimation of Beta

An alternative and more practical approach is to estimate beta directly by using the market model described above. The market model, $R_i = \alpha_i + \beta_i R_m + e_i$, is estimated by using regression analysis, which is a statistical process that evaluates the relationship between a given variable (the dependent variable) and one or more other (independent) variables. Historical security returns (R_i) and historical market returns (R_m) are inputs used for estimating the two parameters α_i and β_i .

Regression analysis is similar to plotting all combinations of the asset's return and the market return (R_i, R_m) and then drawing a line through all points such that it minimizes the sum of squared linear deviations from the line. Exhibit 6 illustrates the market model and the estimated parameters. The intercept, α_i (sometimes referred to as the constant), and the slope term, β_i , are all that is needed to define the security characteristic line and obtain beta estimates.

Exhibit 6: Beta Estimation Using a Plot of Security and Market Returns



Although beta estimates are important for forecasting future levels of risk, there is much concern about their accuracy. In general, shorter periods of estimation (e.g., 12 months) represent betas that are closer to the asset's current level of systematic risk. Shorter period beta estimates, however, are also less accurate than beta estimates measured over three to five years because they may be affected by special events in that

short period. Although longer period beta estimates are more accurate, they may be a poor representation of future expectations, especially if major changes in the asset have occurred. Therefore, it is necessary to recognize that estimates of beta, whether obtained through calculation or regression analysis, may or may not represent current or future levels of an asset's systematic risk.

Beta and Expected Return

Although the single-index model, also called the **capital asset pricing model** (CAPM), will be discussed in greater detail in the next section, we will use the CAPM in this section to estimate returns, given asset betas. The CAPM is usually written with the risk-free rate on the right-hand side:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

The model shows that the primary determinant of expected return for a security is its beta, or how well the security correlates with the market. The higher the beta of an asset, the higher its expected return will be. Assets with a beta greater than 1 have an expected return that is higher than the market return, whereas assets with a beta of less than 1 have an expected return that is less than the market return.

In certain cases, assets may require a return less than the risk-free return. For example, if an asset's beta is negative, the required return will be less than the risk-free rate. When combined with the market, the asset reduces the risk of the overall portfolio, which makes the asset very valuable. Insurance is one such asset. Insurance gives a positive return when the insured's wealth is reduced because of a catastrophic loss. In the absence of such a loss or when the insured's wealth is growing, the insured is required to pay an insurance premium. Thus, insurance has a negative beta and a negative expected return, but helps in reducing overall risk.

EXAMPLE 6

Calculation of Expected Return

1. Alpha Natural Resources (ANR), a coal producer, buys a large but privately held coal producer in China. As a result of the cross-border acquisition of a private company, ANR's standard deviation of returns is reduced from 50 percent to 30 percent and its correlation with the market falls from 0.95 to 0.75. Assume that the standard deviation and return of the market remain unchanged at 25 percent and 10 percent, respectively, and that the risk-free rate is 3 percent.
 - A. Calculate the beta of ANR stock and its expected return before the acquisition.
 - B. Calculate the expected return after the acquisition.

Solution to 1A:

Using the formula for β_i , we can calculate β_i and then the return.

$$\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m} = \frac{0.95 \times 0.50}{0.25} = 1.90$$

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 1.90 \times (0.10 - 0.03) = 0.163 = 16.3\%$$

Solution to 1B:

We follow the same procedure but with the after-acquisition correlation and risk.

$$\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m} = \frac{0.75 \times 0.30}{0.25} = 0.90$$

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 0.90 \times (0.10 - 0.03) = 0.093 = 9.3\%$$

The market risk premium is 7 percent (10% – 3%). As the beta changes, the change in the security's expected return is the market risk premium multiplied by the change in beta. In this scenario, ANR's beta decreased by 1.0, so the new expected return for ANR is 7 percentage points lower.

2. Mr. Miles observes the strong demand for iPods and iPhones and wants to invest in Apple stock. Unfortunately, Mr. Miles doesn't know the return he should expect from his investment. He has been given a risk-free rate of 3 percent, a market return of 10 percent, and Apple's beta of 1.5.

A. Calculate Apple's expected return.

B. An analyst looking at the same information decides that the past performance of Apple is not representative of its future performance. He decides that, given the increase in Apple's market capitalization, Apple acts much more like the market than before and thinks Apple's beta should be closer to 1.1. What is the analyst's expected return for Apple stock?

Solution to 2A:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 1.5 \times (0.10 - 0.03) = 0.135 = 13.5\%$$

Solution to 2B:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 1.1 \times (0.10 - 0.03) = 0.107 = 10.7\%$$

This example illustrates the lack of connection between estimation of past returns and projection into the future. Investors should be aware of the limitations of using past returns for estimating future returns.

8

CAPITAL ASSET PRICING MODEL: ASSUMPTIONS AND THE SECURITY MARKET LINE

- ☐ explain the capital asset pricing model (CAPM), including its assumptions, and the security market line (SML)
- ☐ calculate and interpret the expected return of an asset using the CAPM

The capital asset pricing model is one of the most significant innovations in portfolio theory. The model is simple, yet powerful; is intuitive, yet profound. The CAPM was introduced independently by William Sharpe, John Lintner, Jack Treynor, and Jan Mossin and builds on Harry Markowitz's earlier work on diversification and modern portfolio theory.² The model provides a linear expected return–beta relationship that precisely determines the expected return given the beta of an asset. In doing so, it makes the transition from total risk to systematic risk, the primary determinant of expected return. Recall the following equation:

² See, for example, Markowitz (1952), Sharpe (1964), Lintner (1965a, 1965b), Treynor (1961, 1962), and Mossin (1966).

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

The CAPM asserts that the expected returns of assets vary only by their systematic risk as measured by beta. Two assets with the same beta will have the same expected return irrespective of the nature of those assets. Given the relationship between risk and return, all assets are defined only by their beta risk, which we will explain as the assumptions are described.

In the remainder of this section, we will examine the assumptions made in arriving at the CAPM and the limitations those assumptions entail. Second, we will implement the CAPM through the security market line to price any portfolio or asset, both efficient and inefficient. Finally, we will discuss ways in which the CAPM can be applied to investments, valuation, and capital budgeting.

Assumptions of the CAPM

Similar to all other models, the CAPM ignores many of the complexities of financial markets by making simplifying assumptions. These assumptions allow us to gain important insights into how assets are priced without complicating the analysis. Once the basic relationships are established, we can relax the assumptions and examine how our insights need to be altered. Some of these assumptions are constraining, whereas others are benign. And other assumptions affect only a particular set of assets or only marginally affect the hypothesized relationships.

1. *Investors are risk-averse, utility-maximizing, rational individuals.*

Risk aversion means that investors expect to be compensated for accepting risk. Note that the assumption does not require investors to have the same degree of risk aversion; it only requires that they are averse to risk. Utility maximization implies that investors want higher returns, not lower returns, and that investors always want more wealth (i.e., investors are never satisfied). Investors are understood to be rational in that they correctly evaluate and analyze available information to arrive at rational decisions. Although rational investors may use the same information to arrive at different estimates of expected risk and expected returns, homogeneity among investors (see Assumption 4) requires that investors be rational individuals.

Risk aversion and utility maximization are generally accepted as reflecting a realistic view of the world. Yet, rationality among investors has been questioned because investors may allow their personal biases and experiences to disrupt their decision making, resulting in suboptimal investments. Nonetheless, the model's results are unaffected by such irrational behavior as long as it does not affect prices in a significant manner (i.e., the trades of irrational investors cancel each other or are dominated by the trades of rational investors).

2. *Markets are frictionless, including no transaction costs and no taxes.*

Frictionless markets allow us to abstract the analysis from the operational characteristics of markets. In doing so, we do not allow the risk–return relationship to be affected by, for example, the trading volume on the New York Stock Exchange or the difference between buying and selling prices. Specifically, frictionless markets do not have transaction costs, taxes, or any costs or restrictions on short selling. We also assume that borrowing and lending at the risk-free rate is possible.

The transaction costs of many large institutions are negligible, and many institutions do not pay taxes. Even the presence of non-zero transaction costs, taxes, or the inability to borrow at the risk-free rate does not

materially affect the general conclusions of the CAPM. Costs of short selling or restrictions on short selling, however, can introduce an upward bias in asset prices, potentially jeopardizing important conclusions of the CAPM.

3. *Investors plan for the same single holding period.*

The CAPM is a single-period model, and all investor decisions are made on the basis of that one period. The assumption of a single period is applied for convenience because working with multi-period models is more difficult. A single-period model, however, does not allow learning to occur, and bad decisions can persist. In addition, maximizing utility at the end of a multi-period horizon may require decisions in certain periods that may seem suboptimal when examined from a single-period perspective. Nonetheless, the single holding period does not severely limit the applicability of the CAPM to multi-period settings.

4. *Investors have homogeneous expectations or beliefs.*

This assumption means that all investors analyze securities in the same way using the same probability distributions and the same inputs for future cash flows. In addition, given that they are rational individuals, the investors will arrive at the same valuations. Because their valuations of all assets are identical, they will generate the same optimal risky portfolio, which we call the market portfolio.

The assumption of homogeneous beliefs can be relaxed as long as the differences in expectations do not generate significantly different optimal risky portfolios.

5. *All investments are infinitely divisible.*

This assumption implies that an individual can invest as little or as much as he or she wishes in an asset. This supposition allows the model to rely on continuous functions rather than on discrete jump functions. The assumption is made for convenience only and has an inconsequential impact on the conclusions of the model.

6. *Investors are price takers.*

The CAPM assumes that there are many investors and that no investor is large enough to influence prices. Thus, investors are price takers, and we assume that security prices are unaffected by investor trades. This assumption is generally true because even though investors may be able to affect prices of small stocks, those stocks are not large enough to affect the primary results of the CAPM.

The main objective of these assumptions is to create a marginal investor who rationally chooses a mean–variance-efficient portfolio in a predictable fashion. We assume away any inefficiency in the market from both operational and informational perspectives. Although some of these assumptions may seem unrealistic, relaxing most of them will have only a minor influence on the model and its results. Moreover, the CAPM, with all its limitations and weaknesses, provides a benchmark for comparison and for generating initial return estimates.

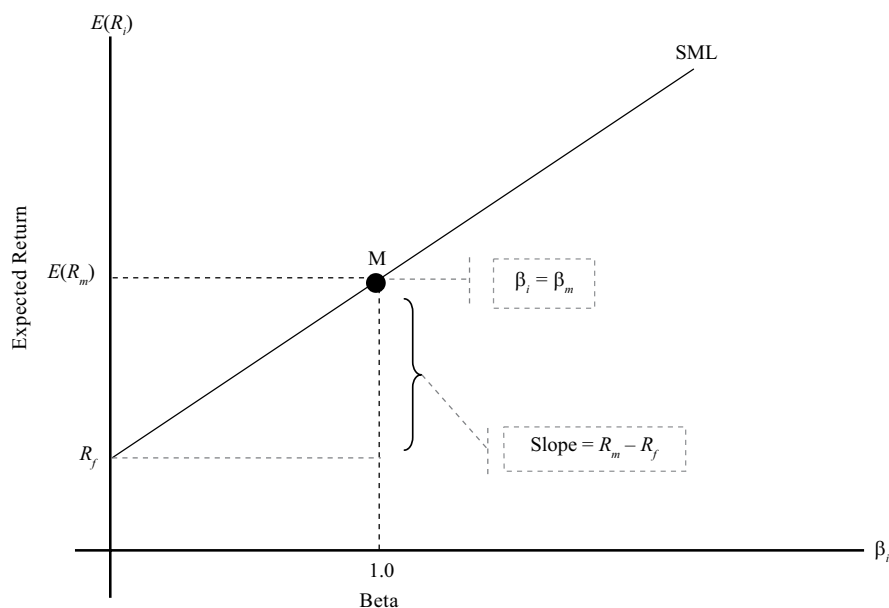
The Security Market Line

In this subsection, we apply the CAPM to the pricing of securities. The **security market line** (SML) is a graphical representation of the capital asset pricing model with beta, reflecting systematic risk, on the x -axis and expected return on the y -axis. Using the same concept as the capital market line, the SML intersects the y -axis at the risk-free

rate of return, and the slope of this line is the market risk premium, $R_m - R_f$. Recall that the capital market line (CML) does not apply to all securities or assets but only to portfolios on the efficient frontier. The efficient frontier gives optimal combinations of expected return and total risk. In contrast, the security market line applies to any security, efficient or not. Total risk and systematic risk are equal only for efficient portfolios because those portfolios have no diversifiable risk remaining.

Exhibit 7 is a graphical representation of the CAPM, the security market line. As shown earlier in this reading, the beta of the market is 1 (x -axis) and the market earns an expected return of R_m (y -axis). Using this line, it is possible to calculate the expected return of an asset. The next example illustrates the beta and return calculations.

Exhibit 7: The Security Market Line



EXAMPLE 7

Security Market Line and Expected Return

1. Suppose the risk-free rate is 3 percent, the expected return on the market portfolio is 13 percent, and its standard deviation is 23 percent. An Indian company, Bajaj Auto, has a standard deviation of 50 percent but is uncorrelated with the market. Calculate Bajaj Auto's beta and expected return.

Solution:

Using the formula for β_i , we can calculate β_i and then the return.

$$\beta_i = \frac{\rho_{i,m} \sigma_i}{\sigma_m} = \frac{0.0 \times 0.50}{0.23} = 0$$

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 0 \times (0.13 - 0.03) = 0.03 = 3.0\%$$

Because of its zero correlation with the market portfolio, Bajaj Auto's beta is zero. Because the beta is zero, the expected return for Bajaj Auto is the risk-free rate, which is 3 percent.

2. Suppose the risk-free rate is 3 percent, the expected return on the market portfolio is 13 percent, and its standard deviation is 23 percent. A German company, Mueller Metals, has a standard deviation of 50 percent and a correlation of 0.65 with the market. Calculate Mueller Metal's beta and expected return.

Solution:

Using the formula for β_i , we can calculate β_i and then the return.

$$\beta_i = \frac{\rho_{i,m} \sigma_i}{\sigma_m} = \frac{0.65 \times 0.50}{0.23} = 1.41$$

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.03 + 1.41 \times (0.13 - 0.03) = 0.171 = 17.1\%$$

Because of the high degree of correlation with the market, the beta for Mueller Metals is 1.41 and the expected return is 17.1 percent. Because Mueller Metals has systematic risk that is greater than that of the market, it has an expected return that exceeds the expected return of the market.

Portfolio Beta

As we stated above, the security market line applies to all securities. But what about a combination of securities, such as a portfolio? Consider two securities, 1 and 2, with a weight of w_i in Security 1 and the balance in Security 2. The return for the two securities and return of the portfolio can be written as:

$$\begin{aligned} E(R_1) &= R_f + \beta_1 [E(R_m) - R_f] \\ E(R_2) &= R_f + \beta_2 [E(R_m) - R_f] \\ E(R_p) &= w_1 E(R_1) + w_2 E(R_2) \\ &= w_1 R_f + w_1 \beta_1 [E(R_m) - R_f] + w_2 R_f + w_2 \beta_2 [E(R_m) - R_f] \\ &= R_f + (w_1 \beta_1 + w_2 \beta_2) [E(R_m) - R_f] \end{aligned}$$

The last equation gives the expression for the portfolio's expected return. From this equation, we can conclude that the portfolio's beta = $w_1 \beta_1 + w_2 \beta_2$. In general, the portfolio beta is a weighted sum of the betas of the component securities and is given by:

$$\beta_p = \sum_{i=1}^n w_i \beta_i; \quad \sum_{i=1}^n w_i = 1$$

The portfolio's return given by the CAPM is

$$E(R_p) = R_f + \beta_p [E(R_m) - R_f]$$

This equation shows that a linear relationship exists between the expected return of a portfolio and the systematic risk of the portfolio as measured by β_p .

EXAMPLE 8

Portfolio Beta and Return

1. You invest 20 percent of your money in the risk-free asset, 30 percent in the market portfolio, and 50 percent in RedHat, a US stock that has a beta of 2.0. Given that the risk-free rate is 4 percent and the market return is 16 percent, what are the portfolio's beta and expected return?

Solution:

The beta of the risk-free asset = 0, the beta of the market = 1, and the beta of RedHat is 2.0. The portfolio beta is

$$\beta_p = w_1\beta_1 + w_2\beta_2 + w_3\beta_3 = (0.20 \times 0.0) + (0.30 \times 1.0) + (0.50 \times 2.0) = 1.30$$

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] = 0.04 + 1.30 \times (0.16 - 0.04) = 0.196 = 19.6\%$$

The portfolio beta is 1.30, and its expected return is 19.6 percent.

Alternate Method:

Another method for calculating the portfolio's return is to calculate individual security returns and then use the portfolio return formula (i.e., weighted average of security returns) to calculate the overall portfolio return.

Return of the risk-free asset = 4 percent; return of the market = 16 percent

RedHat's return based on its beta = $0.04 + 2.0 \times (0.16 - 0.04) = 0.28$

Portfolio return = $(0.20 \times 0.04) + (0.30 \times 0.16) + (0.50 \times 0.28) = 0.196$
 = 19.6%

Not surprisingly, the portfolio return is 19.6 percent, as calculated in the first method.

CAPITAL ASSET PRICING MODEL: APPLICATIONS

9

- ☐ calculate and interpret the expected return of an asset using the CAPM
- ☐ describe and demonstrate applications of the CAPM and the SML

The CAPM offers powerful and intuitively appealing predictions about risk and the relationship between risk and return. The CAPM is not only important from a theoretical perspective but is also used extensively in practice. In this section, we will discuss some common applications of the model. When applying these tools to different scenarios, it is important to understand that the CAPM and the SML are functions that give an indication of what the return in the market *should* be, given a certain level of risk. The actual return may be quite different from the expected return.

Applications of the CAPM include estimates of the expected return for capital budgeting, comparison of the actual return of a portfolio or portfolio manager with the CAPM return for performance appraisal, and the analysis of alternate return estimates and the CAPM returns as the basis for security selection. The applications are discussed in more detail in this section.

Estimate of Expected Return

Given an asset's systematic risk, the expected return can be calculated using the CAPM. Recall that the price of an asset is the sum of all future cash flows discounted at the required rate of return, where the discount rate or the required rate of return is commensurate with the asset's risk. The expected rate of return obtained from the CAPM is normally the first estimate that investors use for valuing assets, such as stocks, bonds, real estate, and other similar assets. The required rate of return from the CAPM is also used for capital budgeting and determining the economic feasibility of projects. Again, recall that when computing the net present value of a project, investments and net revenues are considered cash flows and are discounted at the required rate of return. The required rate of return, based on the project's risk, is calculated using the CAPM.

Because risk and return underlie almost all aspects of investment decision making, it is not surprising that the CAPM is used for estimating expected return in many scenarios. Other examples include calculating the cost of capital for regulated companies by regulatory commissions and setting fair insurance premiums. The next example shows an application of the CAPM to capital budgeting.

EXAMPLE 9

Application of the CAPM to Capital Budgeting

GlaxoSmithKline Plc is examining the economic feasibility of developing a new medicine. The initial investment in Year 1 is \$500 million. The investment in Year 2 is \$200 million. There is a 50 percent chance that the medicine will be developed and will be successful. If that happens, GlaxoSmithKline must spend another \$100 million in Year 3, but its income from the project in Year 3 will be \$500 million, not including the third-year investment. In Years 4, 5, and 6, it will earn \$400 million a year if the medicine is successful. At the end of Year 6, it intends to sell all rights to the medicine for \$600 million. If the medicine is unsuccessful, none of GlaxoSmithKline's investments can be salvaged. Assume that the market return is 12 percent, the risk-free rate is 2 percent, and the beta risk of the project is 2.3. All cash flows occur at the end of each year.

1. Calculate the expected annual cash flows using the probability of success.

Solution:

There is a 50 percent chance that the cash flows in Years 3–6 will occur. Taking that into account, the expected annual cash flows are:

Year 1: –\$500 million (outflow)

Year 2: –\$200 million (outflow)

Year 3: 50% of –\$100 million (outflow) + 50% of \$500 million = \$200 million

Year 4: 50% of \$400 million = \$200 million

Year 5: 50% of \$400 million = \$200 million

Year 6: 50% of \$400 million + 50% of \$600 million = \$500 million

2. Calculate the expected return.

Solution to 2:

The expected or required return for the project can be calculated using the CAPM, which is $= 0.02 + 2.3 \times (0.12 - 0.02) = 0.25$.

3. Calculate the net present value.

Solution:

The net present value is the discounted value of all cash flows:

$$\begin{aligned}
 NPV &= \sum_{t=0}^T \frac{CF_t}{(1+r_t)^t} \\
 &= \frac{-500}{(1+0.25)} + \frac{-200}{(1+0.25)^2} + \frac{200}{(1+0.25)^3} + \frac{200}{(1+0.25)^4} \\
 &\quad + \frac{200}{(1+0.25)^5} + \frac{500}{(1+0.25)^6} \\
 &= -400 - 128 + 102.40 + 81.92 + 65.54 + 131.07 = -147.07.
 \end{aligned}$$

Because the net present value is negative (−\$147.07 million), the project should not be accepted by GlaxoSmithKline.

BEYOND CAPM: LIMITATIONS AND EXTENSIONS OF CAPM

10

☐ describe and demonstrate applications of the CAPM and the SML

In general, return-generating models allow us to estimate an asset's return given its characteristics, where the asset characteristics required for estimating the return are specified in the model. Estimating an asset's return is important for investment decision making. These models are also important as a benchmark for evaluating portfolio, security, or manager performance. The return-generating models were briefly introduced in Section 3.2.1, and one of those models, the capital asset pricing model, was discussed in detail in Section 4.

The purpose of this section is to make readers aware that, although the CAPM is an important concept and model, the CAPM is not the only return-generating model. In this section, we revisit and highlight the limitations of the CAPM and preview return-generating models that address some of those limitations.

Limitations of the CAPM

The CAPM is subject to theoretical and practical limitations. Theoretical limitations are inherent in the structure of the model, whereas practical limitations are those that arise in implementing the model.

Theoretical Limitations of the CAPM

- Single-factor model: Only systematic risk or beta risk is priced in the CAPM. Thus, the CAPM states that no other investment characteristics should be considered in estimating returns. As a consequence, it is prescriptive and easy to understand and apply, although it is very restrictive and inflexible.
- Single-period model: The CAPM is a single-period model that does not consider multi-period implications or investment objectives of future periods, which can lead to myopic and suboptimal investment decisions. For example, it may be optimal to default on interest payments in the current period to maximize current returns, but the consequences may be negative in the next period. A single-period model like the CAPM is unable to capture factors that vary over time and span several periods.

Practical Limitations of the CAPM

In addition to the theoretical limitations, implementation of the CAPM raises several practical concerns, some of which are listed below.

- Market portfolio: The true market portfolio according to the CAPM includes all assets, financial and nonfinancial, which means that it also includes many assets that are not investable, such as human capital and assets in closed economies. Richard Roll³ noted that one reason the CAPM is not testable is that the true market portfolio is unobservable.
- Proxy for a market portfolio: In the absence of a true market portfolio, market participants generally use proxies. These proxies, however, vary among analysts, the country of the investor, etc. and generate different return estimates for the same asset, which is impermissible in the CAPM.
- Estimation of beta risk: A long history of returns (three to five years) is required to estimate beta risk. The historical state of the company, however, may not be an accurate representation of the current or future state of the company. More generally, the CAPM is an *ex ante* model, yet it is usually applied using *ex post* data. In addition, using different periods for estimation results in different estimates of beta. For example, a three-year beta is unlikely to be the same as a five-year beta, and a beta estimated with daily returns is unlikely to be the same as the beta estimated with monthly returns. Thus, we are likely to estimate different returns for the same asset depending on the estimate of beta risk used in the model.
- The CAPM is a poor predictor of returns: If the CAPM is a good model, its estimate of asset returns should be closely associated with realized returns. However, empirical support for the CAPM is weak.⁴ In other words, tests of the CAPM show that asset returns are not determined only by systematic risk. Poor predictability of returns when using the CAPM is a serious limitation because return-generating models are used to estimate future returns.
- Homogeneity in investor expectations: The CAPM assumes that homogeneity exists in investor expectations for the model to generate a single optimal risky portfolio (the market) and a single security market line. Without this assumption, there will be numerous optimal risky portfolios and numerous security market lines. Clearly, investors can process the same information in a rational manner and arrive at different optimal risky portfolios.

³ Roll (1977).

⁴ See, for example, Fama and French (1992).

Extensions to the CAPM

Given the limitations of the CAPM, it is not surprising that other models have been proposed to address some of these limitations. These new models are not without limitations of their own, which we will mention while discussing the models. We divide the models into two categories—theoretical models and practical models—and provide one example of each type.

Theoretical Models

Theoretical models are based on the same principle as the CAPM but expand the number of risk factors. The best example of a theoretical model is the arbitrage pricing theory (APT), which was developed by Stephen Ross.⁵ Like the CAPM, APT proposes a linear relationship between expected return and risk:

$$E(R_p) = R_F + \lambda_1 \beta_{p,1} + \dots + \lambda_K \beta_{p,K}$$

where

$E(R_p)$ = the expected return of portfolio p

R_F = the risk-free rate

λ_j = the risk premium (expected return in excess of the risk-free rate) for factor j

$\beta_{p,j}$ = the sensitivity of the portfolio to factor j

K = the number of risk factors

Unlike the CAPM, however, APT allows numerous risk factors—as many as are relevant to a particular asset. Moreover, other than the risk-free rate, the risk factors need not be common and may vary from one asset to another. A no-arbitrage condition in asset markets is used to determine the risk factors and estimate betas for the risk factors.

Although it is theoretically elegant, flexible, and superior to the CAPM, APT is not commonly used in practice because it does not specify any of the risk factors and it becomes difficult to identify risk factors and estimate betas for each asset in a portfolio. So from a practical standpoint, the CAPM is preferred to APT.

Practical Models

If beta risk in the CAPM does not explain returns, which factors do? Practical models seek to answer this question through extensive research. As mentioned in Section 3.2.1, the best example of such a model is the four-factor model proposed by Fama and French (1992) and Carhart (1997).

Based on an analysis of the relationship between past returns and a variety of different factors, Fama and French (1992) proposed that three factors seem to explain asset returns better than just systematic risk. Those three factors are relative size, relative book-to-market value, and beta of the asset. With Carhart's (1997) addition of relative past stock returns, the model can be written as follows:

$$E(R_{it}) = \alpha_i + \beta_{i,MKT} MKT_t + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \beta_{i,UMD} UMD_t$$

⁵ Ross (1976).

where

$E(R_i)$ = the return on an asset in excess of the one-month T-bill return

MKT = the excess return on the market portfolio

SMB = the difference in returns between small-capitalization stocks and large-capitalization stocks (size)

HML = the difference in returns between high-book-to-market stocks and low-book-to-market stocks (value versus growth)

UMD = the difference in returns of the prior year's winners and losers (momentum)

Historical analysis shows that the coefficient on MKT is not significantly different from zero, which implies that stock return is unrelated to the market. The factors that explain stock returns are size (smaller companies outperform larger companies), book-to-market ratio (value companies outperform glamour companies), and momentum (past winners outperform past losers).

The four-factor model has been found to predict asset returns much better than the CAPM and is extensively used in estimating returns for US stocks.

Two observations are in order. First, the model is not underpinned by a theory of market equilibrium, as is the case for the CAPM. Second, there is no assurance that the model will continue to work well in the future.

11

PORTFOLIO PERFORMANCE APPRAISAL MEASURES



calculate and interpret the Sharpe ratio, Treynor ratio, M^2 , and Jensen's alpha

In the investment industry, **performance evaluation** refers to the measurement, attribution, and appraisal of investment results. In particular, performance evaluation provides information about the return and risk of investment portfolios over specified investment period(s). By providing accurate data and analysis on investment decisions and their consequences, performance evaluation allows portfolio managers to take corrective measures to improve investment decision-making and management processes. Performance evaluation information helps in understanding and controlling investment risk and should, therefore, lead to improved risk management. Performance evaluation seeks to answer the following questions:

- What was the investment portfolio's past performance, and what may be expected in the future?

Answering this question is the subject of performance measurement. *Performance measurement is concerned with the measurement of return and risk.*

- How did the investment portfolio produce its observed performance, and what are the expected sources of expected future performance?

Answering this question is the subject of performance attribution. *Performance attribution is concerned with identifying and quantifying the sources of performance of a portfolio.*

- Was the observed investment portfolio's performance the result of investment skill or luck?

Answering this question is the subject of performance appraisal. *Performance appraisal is concerned with identifying and measuring investment skill.*

The information provided by performance evaluation is of great interest to all stakeholders in the investment management process because of its value in evaluating the overall quality of the investment management process as well as individual investment decisions.

In this reading, performance appraisal is based only on the CAPM. However, it is easy to extend this analysis to multi-factor models that may include industry or other special factors. Four ratios are commonly used in performance appraisal.

The Sharpe Ratio

Performance has two components, risk and return. Although return maximization is a laudable objective, comparing just the return of a portfolio with that of the market is not sufficient. Because investors are risk averse, they will require compensation for higher risk in the form of higher returns. A commonly used measure of performance is the **Sharpe ratio**, which is defined as the portfolio's risk premium divided by its risk. An appealing feature of the Sharpe ratio is that its use can be justified on a theoretical *ex ante* (before the fact) basis and *ex post* (after the fact) values can easily be determined by using readily available market data. The Sharpe ratio is also easy to interpret, essentially being an efficiency ratio relating reward to risks taken. It is the most widely recognized and used appraisal measure.

The equation below defines the *ex ante* Sharpe ratio in terms of three inputs: (1) the portfolio's expected return, $E(R_p)$; (2) the risk-free rate of interest, R_f ; and (3) the portfolio's *ex ante* standard deviation of returns (return volatility), σ_p , a quantitative measure of total risk.

$$SR = \frac{E(R_p) - R_f}{\sigma_p}$$

The Sharpe ratio can also be used on an *ex post* basis to evaluate historical risk-adjusted returns. Assume we have a sample of historical data that can be used to determine the sample mean portfolio return, $\bar{R}_p$; the standard deviation of the sample returns, here denoted by $\hat{\sigma}_p$ (s_p is a familiar notation in other contexts); and the sample mean risk-free rate, $\bar{R}_f$. The *ex post* (or realized or historical) Sharpe ratio can then be determined by using the following:

$$\widehat{SR} = \frac{\bar{R}_p - \bar{R}_f}{\hat{\sigma}_p}$$

Recalling the CAL from earlier in the reading, one can see that the Sharpe ratio, also called the reward-to-variability ratio, is simply the slope of the capital allocation line. Note, however, that the ratio uses the *total risk* of the portfolio, not its systematic risk. The use of total risk is appropriate if the portfolio is an investor's total portfolio—that is, the investor does not own any other assets. Sharpe ratios of the market and other portfolios can also be calculated in a similar manner. The portfolio with the highest Sharpe ratio has the best risk-adjusted performance, and the one with the lowest Sharpe ratio has the worst risk-adjusted performance, provided that the numerator is positive for all comparison portfolios. If the numerator is negative, the ratio will be less negative for riskier portfolios, resulting in incorrect rankings.

The Sharpe ratio, however, suffers from two limitations. First, it uses total risk as a measure of risk when only systematic risk is priced. Second, the ratio itself (e.g., 0.2 or 0.3) is not informative. To rank portfolios, the Sharpe ratio of one portfolio must be compared with the Sharpe ratio of another portfolio. Nonetheless, the ease of computation makes the Sharpe ratio a popular tool.

The Treynor Ratio

The **Treynor ratio** is a simple extension of the Sharpe ratio and resolves the Sharpe ratio's first limitation by substituting beta (systematic risk) for total risk. The *ex ante* and *ex post* Treynor ratios are provided below.

$$TR = \frac{E(R_p) - R_f}{\beta_p}$$

$$\widehat{TR} = \frac{\bar{R}_p - \bar{R}_f}{\hat{\beta}_p}$$

Just like the Sharpe ratio, the numerators must be positive for the Treynor ratio to give meaningful results. In addition, the Treynor ratio does not work for negative-beta assets—that is, the denominator must also be positive for obtaining correct estimates and rankings. Although both the Sharpe and Treynor ratios allow for ranking of portfolios, neither ratio gives any information about the economic significance of differences in performance. For example, assume the Sharpe ratio of one portfolio is 0.75 and the Sharpe ratio for another portfolio is 0.80. The second portfolio is superior, but is that difference meaningful? In addition, we do not know whether either of the portfolios is better than the passive market portfolio. The remaining two measures, M^2 and Jensen's alpha, attempt to address that problem by comparing portfolios while also providing information about the extent of the overperformance or underperformance.

M^2 : Risk-Adjusted Performance (RAP)

M^2 provides a measure of portfolio return that is adjusted for the total risk of the portfolio relative to that of some benchmark. In 1997, Nobel Prize winner Franco Modigliani and his granddaughter, Leah Modigliani, developed what they called a risk-adjusted performance measure, or RAP. The RAP measure has since become more commonly known as M^2 reflecting the Modigliani names. It is related to the Sharpe ratio and ranks portfolios identically, but it has the useful advantage of being denominated in familiar terms of percentage return advantage assuming the same level of total risk as the market

M^2 borrows from capital market theory by assuming a portfolio is leveraged or de-leveraged until its volatility (as measured by standard deviation) matches that of the market. This adjustment produces a portfolio-specific leverage ratio that equates the portfolio's risk to that of the market. The portfolio's excess return times the leverage ratio plus the risk-free rate is then compared with the market's actual return to determine whether the portfolio has outperformed or underperformed the market on a risk-adjusted basis.

The equations below provide the *ex ante* and *ex post* formulas for M^2 , where σ_m is the standard deviation of the market portfolio and σ_m/σ_p is the portfolio-specific leverage ratio. Because the Sharpe ratio is defined as

$$\frac{E(R_p) - R_f}{\sigma_p}$$

the equation shows that M^2 can be thought of as a rescaling of the Sharpe ratio that allows for easier comparisons among different portfolios. The reason that M^2 and Sharpe ratios rank portfolios identically is because, in a given time period—and for any given comparison of the market portfolio—both the risk-free rate and the market volatility are constant across all comparisons. Only the Sharpe ratio differs, so it determines all rankings.

$$M^2 = \left[E(R_p) - R_f \right] \frac{\sigma_m}{\sigma_p} + R_f = SR \times \sigma_m + R_f (\text{ex ante})$$

$$\widehat{M^2} = (\bar{R}_p - \bar{R}_f) \frac{\hat{\sigma}_m}{\hat{\sigma}_p} + R_f = \widehat{SR} \times \hat{\sigma}_m + R_f (\text{ex post})$$

For example, assume that $\bar{R}_f = 4.0\%$, $\bar{R}_p = 14.0\%$, $\hat{\sigma}_p = 25.0\%$ and $\hat{\sigma}_m = 20.0\%$. The Sharpe ratio is 0.4,

$$\widehat{SR} = \frac{0.14 - 0.04}{0.25} = 0.4,$$

and $\widehat{M^2}$ is 12.0%, $\widehat{M^2} = 0.4(0.2) + 0.04 = 0.12 = 12.0\%$. If the market return was 10%, then the portfolio outperformed the market on a risk-adjusted basis by $12.0\% - 10.0\% = 2.0\%$. This difference between the risk-adjusted performance of the portfolio and the performance of the market is frequently referred to as **M^2 alpha**.

The Sharpe ratio of the market portfolio is

$$\widehat{SR} = \frac{0.10 - 0.04}{0.20}$$

= 0.3. Comparing the Sharpe ratio of the portfolio with the Sharpe ratio of the market portfolio shows that the fund outperformed the market. But the 2.0% difference between M^2 and the market's return tells us the risk-adjusted outperformance as a percentage return.

Jensen's Alpha

Like the Treynor ratio, Jensen's alpha is based on systematic risk. We can measure a portfolio's systematic risk by estimating the market model, which is done by regressing the portfolio's daily return on the market's daily return. The coefficient on the market return is an estimate of the beta risk of the portfolio. We can calculate the risk-adjusted return of the portfolio using the beta of the portfolio and the CAPM. The difference between the actual portfolio return and the calculated risk-adjusted return is a measure of the portfolio's performance relative to the market portfolio and is called Jensen's alpha. By definition, α_m of the market is zero. Jensen's alpha is also the vertical distance from the SML measuring the excess return for the same risk as that of the market and is given by

$$\alpha_p = R_p - \{R_f + \beta_p[E(R_m) - R_f]\}$$

If the period is long, it may contain different risk-free rates, in which case R_f represents the average risk-free rate. Furthermore, the returns in the equation are all realized, actual returns. The sign of α_p indicates whether the portfolio has outperformed the market. If α_p is positive, then the portfolio has outperformed the market; if α_p is negative, the portfolio has underperformed the market. Jensen's alpha is commonly used for evaluating most institutional managers, pension funds, and mutual funds. Values of alpha can be used to rank different managers and the performance of their portfolios, as well as the magnitude of underperformance or overperformance. For example, if a portfolio's alpha is 2 percent and another portfolio's alpha is 5 percent, the second portfolio has outperformed the first portfolio by 3 percentage points and the market by 5 percentage points. Jensen's alpha is the maximum amount that you should be willing to pay the manager to manage your money. As with other performance appraisal measures, Jensen's alpha has *ex ante* and *ex post* forms. The use

context usually clarifies which one is being referred to. Where we want to underscore a reference to *ex post* Jensen's alpha based on an estimated beta, $\hat{\beta}_p$, and an average market return, the notation $\hat{\alpha}_p$ is used.

EXAMPLE 10**Portfolio Performance Evaluation**

1. A British pension fund has employed three investment managers, each of whom is responsible for investing in one-third of all asset classes so that the pension fund has a well-diversified portfolio. Information about the managers is given below.

Manager	Average Return	$\hat{\sigma}$	$\hat{\beta}$
X	10%	20%	1.1
Y	11	10	0.7
Z	12	25	0.6
Market (M)	9	19	
Risk-free rate (R_f)	3		

Calculate the expected return for each manager, based on using the average market return and the CAPM. Then also calculate for the managers (ex post) Sharpe ratio, Treynor ratio, M² alpha, and Jensen's alpha. Analyze your results and plot the returns and betas of these portfolios.

Solution:

In each case, the calculations are shown only for Manager X. All answers are tabulated below. Note that the β of the market is 1 and the σ and β of the risk-free rate are both zero.

$$\begin{aligned} \text{Expected return: } E(R_X) &= R_f + \beta_X [E(R_m) - R_f] = 0.03 + 1.10 \\ &\times (0.09 - 0.03) = 0.096 = 9.6\% \end{aligned}$$

$$\widehat{SR} = \frac{\bar{R}_x - \bar{R}_f}{\hat{\sigma}_x} = \frac{0.10 - 0.03}{0.20} = 0.35$$

$$\widehat{TR} = \frac{\bar{R}_x - \bar{R}_f}{\hat{\beta}_x} = \frac{0.10 - 0.03}{1.1} = 0.064$$

$$\begin{aligned} \widehat{M^2} &= (\bar{R}_x - \bar{R}_f) \frac{\hat{\sigma}_m}{\hat{\sigma}_x} + \bar{R}_f = \widehat{SR} \times \hat{\sigma}_m + \bar{R}_f \\ &= 0.35 \times 0.19 + 0.03 = 0.0965 = 9.65\% \end{aligned}$$

Since the market return is 9%, M² alpha is 0.65% (9.65% – 9%).

$$\begin{aligned} \hat{\alpha}_X &= R_X - [R_f + \hat{\beta}_X (\bar{R}_m - \bar{R}_f)] = 0.10 - (0.03 + 1.1 \times 0.06) \\ &= 0.004 = 0.40\% \end{aligned}$$

Exhibit 8: Measures of Portfolio Performance Evaluation

Manager	$\bar{R}_i$	$\hat{\sigma}_i$	$\hat{\beta}_i$	$E(R_i)$	Sharpe Ratio	Treynor Ratio	M ² alpha	$\hat{\alpha}_i$
X	10.0%	20.0%	1.10	9.6%	0.35	0.064	0.65%	0.40%
Y	11.0	10.0	0.70	7.2	0.80	0.114	9.20	3.80
Z	12.0	25.0	0.60	6.6	0.36	0.150	0.84	5.40
M	9.0	19.0	1.00	9.0	0.32	0.060	0.00	0.00
R_f	3.0	0.0	0.00	3.0	–	–	–	0.00

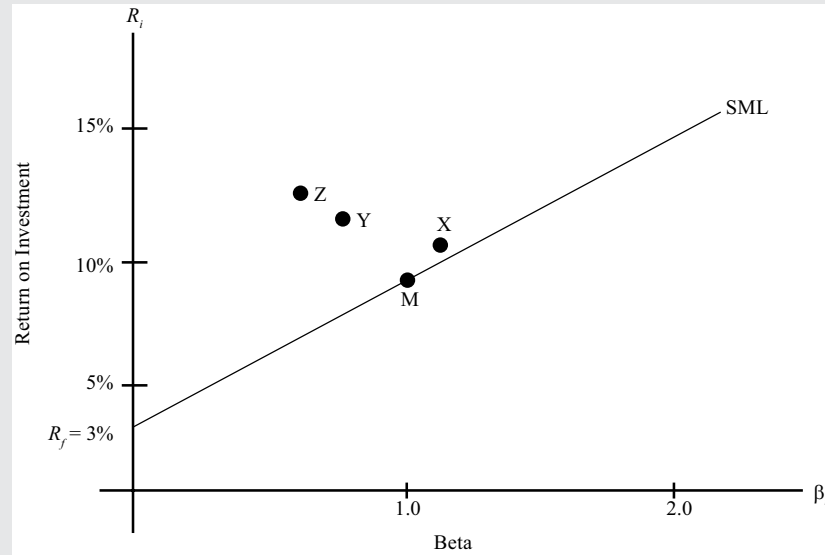
Let us begin with an analysis of the risk-free asset. Because the risk-free asset has zero risk and a beta of zero, calculating the Sharpe ratio, Treynor ratio, or M² is not possible because they all require the portfolio risk in the denominator. The risk-free asset's alpha, however, is zero. Turning to the market portfolio, we see that the absolute measures of performance, the Sharpe ratio and the Treynor ratio, are positive for the market portfolio. These ratios are positive as long as the portfolio earns a return that is in excess of that of the risk-free asset. $\hat{M}^2$ and $\hat{\alpha}_i$ are performance measures relative to the market, so they are both equal to zero for the market portfolio. All three managers have Sharpe and Treynor ratios greater than those of the market, and all three managers' M² alpha and α_i are positive; therefore, the pension fund should be satisfied with their performance. Among the three managers, Manager X has the worst performance, irrespective of whether total risk or systematic risk is considered for measuring performance. The relative rankings are depicted in Exhibit 9.

Exhibit 9: Ranking of Portfolios by Performance Measure

Rank	Sharpe Ratio	Treynor Ratio	M ² alpha	α_i
1	Y	Z	Y	Z
2	Z	Y	Z	Y
3	X	X	X	X
4	M	M	M	M
5	–	–	–	R_f

Comparing Y and Z, we can observe that Y performs much better than Z when total risk is considered. Y has a Sharpe ratio of 0.80, compared with a Sharpe ratio of 0.36 for Z. Similarly, M² alpha is higher for Y (9.20 percent) than for Z (0.84 percent). In contrast, when systematic risk is used, Z outperforms Y. The Treynor ratio is higher for Z (0.150) than for Y (0.114), and Jensen's alpha is also higher for Z (5.40 percent) than for Y (3.80 percent), which indicates that Z has done a better job of generating excess return relative to systematic risk than Y.

Exhibit 10 confirms these observations in that all three managers outperform the benchmark because all three points lie above the SML. Among the three portfolios, Z performs the best when we consider risk-adjusted returns because it is the point in Exhibit 10 that is located northwest relative to the portfolios X and Y.

Exhibit 10: Portfolios Along the SML

When do we use total risk performance measures like the Sharpe ratio and M^2 , and when do we use beta risk performance measures like the Treynor ratio and Jensen's alpha? Total risk is relevant for an investor when he or she holds a portfolio that is not fully diversified, which is not a desirable portfolio. In such cases, the Sharpe ratio and M^2 are appropriate performance measures. Thus, if the pension fund were to choose only one fund manager to manage all its assets, it should choose Manager Y. Performance measures relative to beta risk—Treynor ratio and Jensen's alpha—are relevant when the investor holds a well-diversified portfolio with negligible diversifiable risk. In other words, if the pension fund is well diversified and only the systematic risk of the portfolio matters, the fund should choose Manager Z.

The measures of performance evaluation assume that the market portfolio is the correct benchmark. As a result, an error in the benchmark may cause the results to be misleading. For example, evaluating a real estate fund against the S&P 500 is incorrect because real estate has different characteristics than equity. In addition to errors in benchmarking, errors could occur in the measurement of risk and return of the market portfolio and the portfolios being evaluated. Finally, many estimates are based on historical data. Any projections based on such estimates assume that this level of performance will continue in the future.

12

APPLICATIONS OF THE CAPM IN PORTFOLIO CONSTRUCTION

- ☐ calculate and interpret the expected return of an asset using the CAPM
- ☐ describe and demonstrate applications of the CAPM and the SML

This section introduces applications of the CAPM in portfolio construction. First, the security characteristic line, which graphically indicates *ex post* Jensen's alpha, is described. If we relax the assumption that investors have the same expectations about risk and return, a positive Jensen's alpha can be interpreted as an indication of superior information or investment ability. The section on security selection covers that possibility. The last section summarizes how the CAPM and related concepts can be applied to portfolio construction.

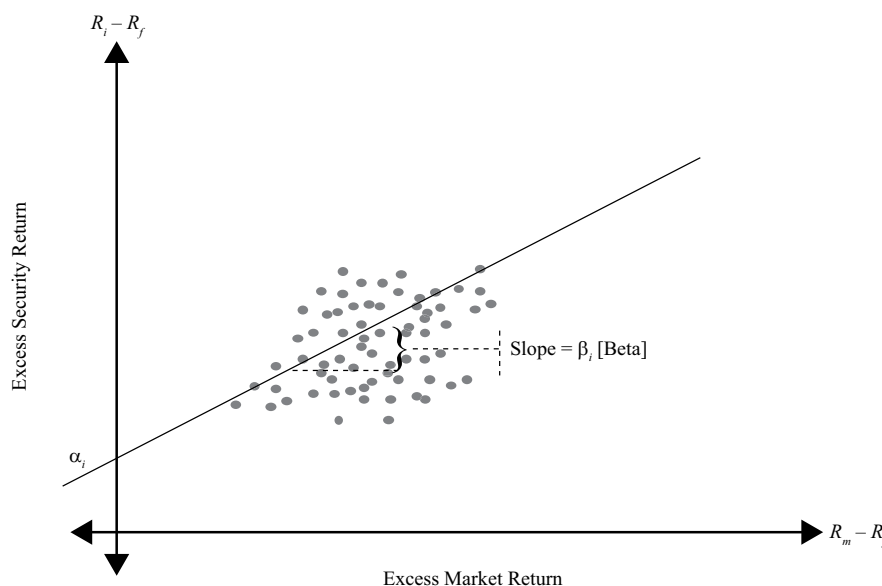
Security Characteristic Line

Similar to the SML, we can draw a **security characteristic line (SCL)** for a security. The SCL is a plot of the excess return of the security on the excess return of the market. In Exhibit 8, Jensen's alpha is the intercept and the beta is the slope. The equation of the line can be obtained by rearranging the terms in the expression for Jensen's alpha and replacing the subscript p with i :

$$R_i - R_f = \alpha_i + \beta_i(R_m - R_f)$$

As an example, the SCL is drawn in Exhibit 11 using Manager X's portfolio from Exhibit 8. The security characteristic line can also be estimated by regressing the excess security return, $R_i - R_f$ on the excess market return, $R_m - R_f$.

Exhibit 11: The Security Characteristic Line



Security Selection

When discussing the CAPM, we assumed that investors have homogeneous expectations and are rational, risk-averse, utility-maximizing investors. With these assumptions, we were able to state that all investors assign the same value to all assets and, therefore, have the same optimal risky portfolio, which is the market portfolio. In other words, we assumed that there is commonality among beliefs about an asset's

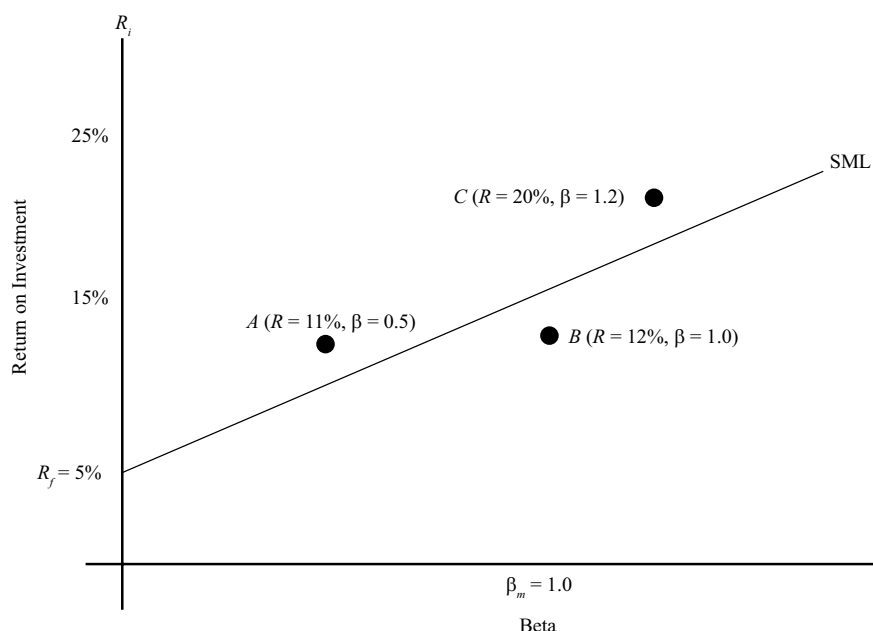
future cash flows and the required rate of return. Given the required rate of return, we can discount the future cash flows of the asset to arrive at its current value, or price, which is agreed upon by all or most investors.

In this section, we introduce heterogeneity in beliefs of investors. Because investors are price takers, it is assumed that such heterogeneity does not significantly affect the market price of an asset. The difference in beliefs can relate to future cash flows, the systematic risk of the asset, or both. Because the current price of an asset is the discounted value of the future cash flows, the difference in beliefs could result in an investor-estimated price that is different from the CAPM-calculated price. The CAPM-calculated price is the current market price because it reflects the beliefs of all other investors in the market. If the investor-estimated current price is higher (lower) than the market price, the asset is considered undervalued (overvalued). Therefore, the CAPM is an effective tool for determining whether an asset is undervalued or overvalued and whether an investor should buy or sell the asset.

Although portfolio performance evaluation is backward looking and security selection is forward looking, we can apply the concepts of portfolio evaluation to security selection. The best measure to apply is Jensen's alpha because it uses systematic risk and is meaningful even on an absolute basis. A positive Jensen's alpha indicates a superior security, whereas a negative Jensen's alpha indicates a security that is likely to underperform the market when adjusted for risk.

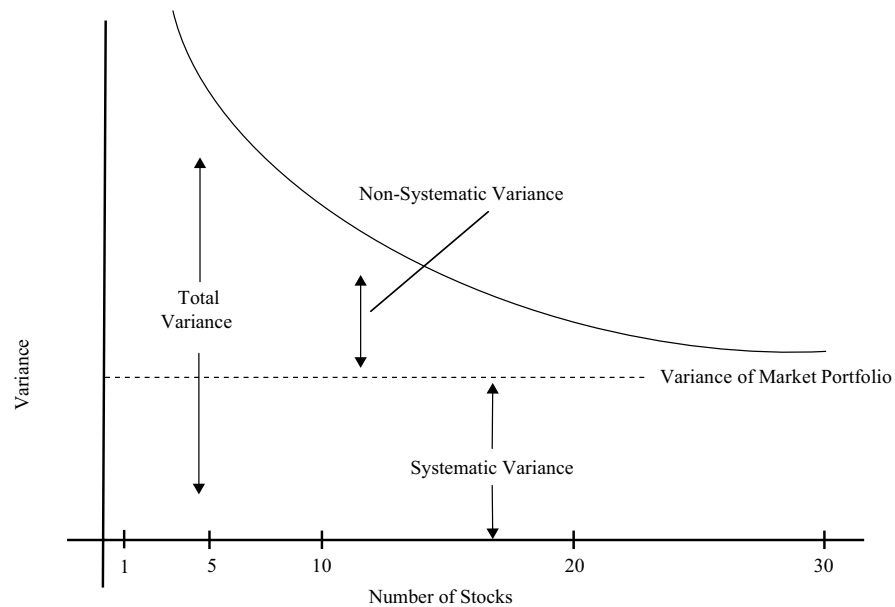
Another way of presenting the same information is with the security market line. Potential investors can plot a security's expected return and beta against the SML and use this relationship to decide whether the security is overvalued or undervalued in the market.⁶ Exhibit 12 shows a number of securities along with the SML. All securities that reflect the consensus market view are points directly on the SML (i.e., properly valued). If a point representing the estimated return of an asset is above the SML (Points A and C), the asset has a low level of risk relative to the amount of expected return and would be a good choice for investment. In contrast, if the point representing a particular asset is below the SML (Point B), the stock is considered overvalued. Its return does not compensate for the level of risk and should not be considered for investment. Of course, a short position in Asset B can be taken if short selling is permitted.

⁶ In this reading, we do not consider transaction costs, which are important whenever deviations from a passive portfolio are considered. Thus, the magnitude of undervaluation or overvaluation should be considered in relation to transaction costs prior to making an investment decision.

Exhibit 12: Security Selection Using SML

Implications of the CAPM for Portfolio Construction

Based on the CAPM, investors should hold a combination of the risk-free asset and the market portfolio. The true market portfolio consists of a large number of securities, and an investor would have to own all of them in order to be completely diversified. Because owning all existing securities is not practical, in this section, we will consider an alternate method of constructing a portfolio that may not require a large number of securities and will still be sufficiently diversified. Exhibit 13 shows the reduction in risk as we add more and more securities to a portfolio. As can be seen from the exhibit, much of the nonsystematic risk can be diversified away in as few as 30 securities. These securities, however, should be randomly selected and represent different asset classes for the portfolio to effectively diversify risk. Otherwise, one may be better off using an index (e.g., the S&P 500 for a diversified large-cap equity portfolio and other indexes for other asset classes).

Exhibit 13: Diversification with Number of Stocks

Let's begin constructing the optimal portfolio with a portfolio of securities like the S&P 500. Although the S&P 500 is a portfolio of 500 securities, it is a good starting point because it is readily available as a single security for trading. In contrast, it represents only the large corporations that are traded on the US stock markets and, therefore, does not encompass the global market entirely. Because the S&P 500 is the base portfolio, however, we treat it as the market for the CAPM.

Any security not included in the S&P 500 can be evaluated to determine whether it should be integrated into the portfolio. That decision is based on the α_i of the security, which is calculated using the CAPM with the S&P 500 as the market portfolio. Note that security i may not necessarily be priced incorrectly for it to have a non-zero α_i ; α_i can be positive merely because it is not well correlated with the S&P 500 and its return is sufficient for the amount of systematic risk it contains. For example, assume a new stock market, ABC, opens to foreign investors only and is being considered for inclusion in the portfolio. We estimate ABC's model parameters relative to the S&P 500 and find an α_i of approximately 3 percent, with a β_i of 0.60. Because α_i is positive, ABC should be added to the portfolio. Securities with a significantly negative α_i may be short sold to maximize risk-adjusted return. For convenience, however, we will assume that negative positions are not permitted in the portfolio.

In addition to the securities that are correctly priced but enter the portfolio because of their risk–return superiority, securities already in the portfolio (S&P 500) may be undervalued or overvalued based on investor expectations that are incongruent with the market. Securities in the S&P 500 that are overvalued (negative α_i) should be dropped from the S&P 500 portfolio, if it is possible to exclude individual securities, and positions in securities in the S&P 500 that are undervalued (positive α_i) should be increased.

This brings us to the next question: What should the relative weight of securities in the portfolio be? Because we are concerned with maximizing risk-adjusted return, securities with a higher α_i should have a higher weight, and securities with greater nonsystematic risk should be given less weight in the portfolio. A complete analysis of portfolio optimization is beyond the scope of this reading, but the following

principles are helpful. The weight in each nonmarket security should be proportional to $\frac{\alpha_i}{\sigma_{ei}^2}$, where the denominator is the nonsystematic variance of security i . The total weight of nonmarket securities in the portfolio is proportional to

$$\frac{\sum_{i=1}^N w_i \alpha_i}{\sum_{i=1}^N w_i^2 \sigma_{ei}^2}.$$

The weight in the market portfolio is a function of

$$\frac{E(R_m)}{\sigma_m^2}.$$

The information ratio, $\frac{\alpha_i}{\sigma_{ei}^2}$ (i.e., alpha divided by nonsystematic risk), measures the abnormal return per unit of risk added by the security to a well-diversified portfolio. The larger the information ratio is, the more valuable the security.

EXAMPLE 11

Optimal Investor Portfolio with Heterogeneous Beliefs

A Japanese investor is holding the Nikkei 225 index, which is her version of the market. She thinks that three stocks, P, Q, and R, which are not in the Nikkei 225, are undervalued and should form a part of her portfolio. She has the following information about the stocks, the Nikkei 225, and the risk-free rate (the information is given as expected return, standard deviation, and beta):

P: 15%, 30%, 1.5

Q: 18%, 25%, 1.2

R: 16%, 23%, 1.1

Nikkei 225: 12%, 18%, 1.0

Risk-free rate: 2%, 0%, 0.0

1. Calculate Jensen's alpha for P, Q, and R.

Solution:

$$\text{Stock P's } \alpha: R_i - [R_f + \beta_i(R_m - R_f)] = 0.15 - (0.02 + 1.5 \times 0.10) = -0.02$$

$$\text{Stock Q's } \alpha: R_i - [R_f + \beta_i(R_m - R_f)] = 0.18 - (0.02 + 1.2 \times 0.10) = 0.04$$

$$\text{Stock R's } \alpha: R_i - [R_f + \beta_i(R_m - R_f)] = 0.16 - (0.02 + 1.1 \times 0.10) = 0.03$$

2. Calculate nonsystematic variance for P, Q, and R.

Solution:

Total variance = Systematic variance + Nonsystematic variance. From Section 3.2.2, we write the equation as $\sigma_{ei}^2 = \sigma_i^2 - \beta_i^2 \sigma_m^2$.

$$\text{Stock P's nonsystematic variance} = (0.30 \times 0.30) - (1.5 \times 1.5 \times 0.18 \times 0.18) = 0.09 - 0.0729$$

$$= 0.0171$$

$$\text{Stock Q's nonsystematic variance} = (0.25 \times 0.25) - (1.2 \times 1.2 \times 0.18 \times 0.18) = 0.0625 - 0.0467$$

$$= 0.0158$$

$$\text{Stock R's nonsystematic variance} = (0.23 \times 0.23) - (1.1 \times 1.1 \times 0.18 \times 0.18) = 0.0529 - 0.0392$$

$$= 0.0137$$

3. Should any of the three stocks be included in the portfolio? If so, which stock should have the highest weight in the portfolio?

Solution:

Stock P has a negative α and should not be included in the portfolio, unless a negative position can be assumed through short selling. Stocks Q and R have a positive α ; therefore, they should be included in the portfolio with positive weights.

The relative weight of Q is $0.04/0.0158 = 2.53$.

The relative weight of R is $0.03/0.0137 = 2.19$.

Stock Q will have the largest weight among the nonmarket securities to be added to the portfolio. In relative terms, the weight of Q will be 15.5 percent greater than the weight of R ($2.53/2.19 = 1.155$). As the number of securities increases, the analysis becomes more complex. However, the contribution of each additional security toward improvement in the risk–return trade-off will decrease and eventually disappear, resulting in a well-diversified portfolio.

SUMMARY

In this reading, we discussed the capital asset pricing model in detail and covered related topics such as the capital market line. The reading began with an interpretation of the CML, uses of the market portfolio as a passive management strategy, and leveraging of the market portfolio to obtain a higher expected return. Next, we discussed systematic and nonsystematic risk and why one should not expect to be compensated for taking on nonsystematic risk. The discussion of systematic and nonsystematic risk was followed by an introduction to beta and return-generating models. This broad topic was then broken down into a discussion of the CAPM and, more specifically, the relationship between beta and expected return. The final section included applications of the CAPM to capital budgeting, portfolio performance evaluation, and security selection. The highlights of the reading are as follows:

- The capital market line is a special case of the capital allocation line, where the efficient portfolio is the market portfolio.
- Obtaining a unique optimal risky portfolio is not possible if investors are permitted to have heterogeneous beliefs because such beliefs will result in heterogeneous asset prices.

- Investors can leverage their portfolios by borrowing money and investing in the market.
- Systematic risk is the risk that affects the entire market or economy and is not diversifiable.
- Nonsystematic risk is local and can be diversified away by combining assets with low correlations.
- Beta risk, or systematic risk, is priced and earns a return, whereas nonsystematic risk is not priced.
- The expected return of an asset depends on its beta risk and can be computed using the CAPM, which is given by $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$.
- The security market line is an implementation of the CAPM and applies to all securities, whether they are efficient or not.
- Expected return from the CAPM can be used for making capital budgeting decisions.
- Portfolios can be evaluated by several CAPM-based measures, such as the Sharpe ratio, the Treynor ratio, M^2 , and Jensen's alpha.
- The SML can assist in security selection and optimal portfolio construction.

By successfully understanding the content of this reading, you should feel comfortable decomposing total variance into systematic and nonsystematic variance, analyzing beta risk, using the CAPM, and evaluating portfolios and individual securities.

REFERENCES

Carhart, Mark. 1997. "On Persistence in Mutual Fund Performance." *Journal of Finance*, vol. 52, no. 1:57–82. 10.2307/2329556

Fama, Eugene, Kenneth French. 1992. "The Cross-Section of Expected Stock Returns." *Journal of Finance*, vol. 47, no. 2:427–466. 10.2307/2329112



PRACTICE PROBLEMS

1. The line depicting the total risk and expected return of portfolio combinations of a risk-free asset and any risky asset is the:
 - A. security market line.
 - B. capital allocation line.
 - C. security characteristic line.
2. The portfolio of a risk-free asset and a risky asset has a better risk-return tradeoff than investing in only one asset type because the correlation between the risk-free asset and the risky asset is equal to:
 - A. -1.0 .
 - B. 0.0 .
 - C. 1.0 .
3. With respect to capital market theory, an investor's optimal portfolio is the combination of a risk-free asset and a risky asset with the highest:
 - A. expected return.
 - B. indifference curve.
 - C. capital allocation line slope.
4. Highly risk-averse investors will *most likely* invest the majority of their wealth in:
 - A. risky assets.
 - B. risk-free assets.
 - C. the optimal risky portfolio.
5. The capital market line (CML) is the graph of the risk and return of portfolio combinations consisting of the risk-free asset and:
 - A. any risky portfolio.
 - B. the market portfolio.
 - C. the leveraged portfolio.
6. Which of the following statements *most accurately* defines the market portfolio in capital market theory? The market portfolio consists of all:
 - A. risky assets.
 - B. tradable assets.
 - C. investable assets.
7. With respect to capital market theory, the optimal risky portfolio:
 - A. is the market portfolio.

- B. has the highest expected return.
 - C. has the lowest expected variance.
8. Relative to portfolios on the CML, any portfolio that plots above the CML is considered:
- A. inferior.
 - B. inefficient.
 - C. unachievable.
9. A portfolio on the capital market line with returns greater than the returns on the market portfolio represents a(n):
- A. lending portfolio.
 - B. borrowing portfolio.
 - C. unachievable portfolio.
10. With respect to the capital market line, a portfolio on the CML with returns less than the returns on the market portfolio represents a(n):
- A. lending portfolio.
 - B. borrowing portfolio.
 - C. unachievable portfolio.
11. Which of the following types of risk is *most likely* avoided by forming a diversified portfolio?
- A. Total risk.
 - B. Systematic risk.
 - C. Nonsystematic risk.
12. Which of the following events is *most likely* an example of nonsystematic risk?
- A. A decline in interest rates.
 - B. The resignation of chief executive officer.
 - C. An increase in the value of the US dollar.
13. With respect to the pricing of risk in capital market theory, which of the following statements is *most accurate*?
- A. All risk is priced.
 - B. Systematic risk is priced.
 - C. Nonsystematic risk is priced.
14. The sum of an asset's systematic variance and its nonsystematic variance of returns is equal to the asset's:
- A. beta.

- B. total risk.
- C. total variance.

The following information relates to questions 15-17

An analyst gathers the following information:

Security	Expected Annual Return (%)	Expected Standard Deviation (%)	Correlation between Security and the Market
Security 1	11	25	0.6
Security 2	11	20	0.7
Security 3	14	20	0.8
Market	10	15	1.0

15. Which security has the *highest* total risk?
 - A. Security 1.
 - B. Security 2.
 - C. Security 3.
16. Which security has the *highest* beta measure?
 - A. Security 1.
 - B. Security 2.
 - C. Security 3.
17. Which security has the *least* amount of market risk?
 - A. Security 1.
 - B. Security 2.
 - C. Security 3.
18. With respect to return-generating models, the intercept term of the market model is the asset's estimated:
 - A. beta.
 - B. alpha.
 - C. variance.
19. With respect to return-generating models, the slope term of the market model is

an estimate of the asset's:

- A. total risk.
 - B. systematic risk.
 - C. nonsystematic risk.
20. With respect to return-generating models, which of the following statements is *most accurate*? Return-generating models are used to directly estimate the:
- A. expected return of a security.
 - B. weights of securities in a portfolio.
 - C. parameters of the capital market line.
21. With respect to capital market theory, the average beta of all assets in the market is:
- A. less than 1.0.
 - B. equal to 1.0.
 - C. greater than 1.0.
22. With respect to the capital asset pricing model, the primary determinant of expected return of an individual asset is the:
- A. asset's beta.
 - B. market risk premium.
 - C. asset's standard deviation.
23. With respect to the capital asset pricing model, which of the following values of beta for an asset is *most likely* to have an expected return for the asset that is less than the risk-free rate?
- A. -0.5
 - B. 0.0
 - C. 0.5
24. With respect to the capital asset pricing model, the market risk premium is:
- A. less than the excess market return.
 - B. equal to the excess market return.
 - C. greater than the excess market return.
25. The graph of the capital asset pricing model is the:
- A. capital market line.
 - B. security market line.
 - C. security characteristic line.

26. With respect to capital market theory, correctly priced individual assets can be plotted on the:
- A. capital market line.
 - B. security market line.
 - C. capital allocation line.

The following information relates to questions 27-30

An analyst gathers the following information:

Security	Expected Standard Deviation (%)	Beta
Security 1	25	1.50
Security 2	15	1.40
Security 3	20	1.60

27. With respect to the capital asset pricing model, if the expected market risk premium is 6% and the risk-free rate is 3%, the expected return for Security 1 is *closest* to:
- A. 9.0%.
 - B. 12.0%.
 - C. 13.5%.
28. With respect to the capital asset pricing model, if expected return for Security 2 is equal to 11.4% and the risk-free rate is 3%, the expected return for the market is *closest* to:
- A. 8.4%.
 - B. 9.0%.
 - C. 10.3%.
29. With respect to the capital asset pricing model, if the expected market risk premium is 6% the security with the *highest* expected return is:
- A. Security 1.
 - B. Security 2.
 - C. Security 3.
30. With respect to the capital asset pricing model, a decline in the expected market return will have the *greatest* impact on the expected return of:
- A. Security 1.

B. Security 2.

C. Security 3.

31. With respect to capital market theory, which of the following statements *best* describes the effect of the homogeneity assumption? Because all investors have the same economic expectations of future cash flows for all assets, investors will invest in:

A. the same optimal risky portfolio.

B. the Standard and Poor's 500 Index.

C. assets with the same amount of risk.

32. With respect to capital market theory, which of the following assumptions allows for the existence of the market portfolio? All investors:

A. are price takers.

B. have homogeneous expectations.

C. plan for the same, single holding period.

33. Three equity fund managers have performance records summarized in the following table:

	Mean Annual Return (%)	Standard Deviation of Return (%)
Manager 1	14.38	10.53
Manager 2	9.25	6.35
Manager 3	13.10	8.23

Given a risk-free rate of return of 2.60%, which manager performed best based on the Sharpe ratio?

A. Manager 1

B. Manager 2

C. Manager 3

34. Which of the following performance measures is consistent with the CAPM?

A. M^2 .

B. Sharpe ratio.

C. Jensen's alpha.

35. Which of the following performance measures does *not* require the measure to be compared to another value?

A. Sharpe ratio.

B. Treynor ratio.

C. Jensen's alpha.

36. Which of the following performance measures is *most* appropriate for an investor who is *not* fully diversified?
- A. M^2 .
 - B. Treynor ratio.
 - C. Jensen's alpha.
37. The slope of the security characteristic line is an asset's:
- A. beta.
 - B. excess return.
 - C. risk premium.
38. Analysts who have estimated returns of an asset to be greater than the expected returns generated by the capital asset pricing model should consider the asset to be:
- A. overvalued.
 - B. undervalued.
 - C. properly valued.
39. The intercept of the best fit line formed by plotting the excess returns of a manager's portfolio on the excess returns of the market is *best* described as Jensen's:
- A. beta.
 - B. ratio.
 - C. alpha.
40. Portfolio managers who are maximizing risk-adjusted returns will seek to invest *more* in securities with:
- A. lower values of Jensen's alpha.
 - B. values of Jensen's alpha equal to 0.
 - C. higher values of Jensen's alpha.
41. Portfolio managers, who are maximizing risk-adjusted returns, will seek to invest *less* in securities with:
- A. lower values for nonsystematic variance.
 - B. values of nonsystematic variance equal to 0.
 - C. higher values for nonsystematic variance.

SOLUTIONS

1. B is correct. A capital allocation line (CAL) plots the expected return and total risk of combinations of the risk-free asset and a risky asset (or a portfolio of risky assets).
2. B is correct. A portfolio of the risk-free asset and a risky asset or a portfolio of risky assets can result in a better risk-return tradeoff than an investment in only one type of an asset, because the risk-free asset has zero correlation with the risky asset.
3. B is correct. Investors will have different optimal portfolios depending on their indifference curves. The optimal portfolio for each investor is the one with highest utility; that is, where the CAL is tangent to the individual investor's highest possible indifference curve.
4. B is correct. Although the optimal risky portfolio is the market portfolio, highly risk-averse investors choose to invest most of their wealth in the risk-free asset.
5. B is correct. Although the capital allocation line includes all possible combinations of the risk-free asset and any risky portfolio, the capital market line is a special case of the capital allocation line, which uses the market portfolio as the optimal risky portfolio.
6. A is correct. The market includes all risky assets, or anything that has value; however, not all assets are tradable, and not all tradable assets are investable.
7. A is correct. The optimal risky portfolio is the market portfolio. Capital market theory assumes that investors have homogeneous expectations, which means that all investors analyze securities in the same way and are rational. That is, investors use the same probability distributions, use the same inputs for future cash flows, and arrive at the same valuations. Because their valuations of all assets are identical, all investors will invest in the same optimal risky portfolio (i.e., the market portfolio).
8. C is correct. Theoretically, any point above the CML is not achievable and any point below the CML is dominated by and inferior to any point on the CML.
9. B is correct. As one moves further to the right of point M on the capital market line, an increasing amount of borrowed money is being invested in the market portfolio. This means that there is negative investment in the risk-free asset, which is referred to as a leveraged position in the risky portfolio.
10. A is correct. The combinations of the risk-free asset and the market portfolio on the CML where returns are less than the returns on the market portfolio are termed 'lending' portfolios.
11. C is correct. Investors are capable of avoiding nonsystematic risk by forming a portfolio of assets that are not highly correlated with one another, thereby reducing total risk and being exposed only to systematic risk.
12. B is correct. Nonsystematic risk is specific to a firm, whereas systematic risk affects the entire economy.
13. B is correct. Only systematic risk is priced. Investors do not receive any return for accepting nonsystematic or diversifiable risk.

14. C is correct. The sum of systematic variance and nonsystematic variance equals the total variance of the asset. References to total risk as the sum of systematic risk and nonsystematic risk refer to variance, not to risk.

15. A is correct. Security 1 has the highest total risk = 0.25 compared to Security 2 and Security 3 with a total risk of 0.20.

16. C is correct. Security 3 has the highest beta value;

$$1.07 = \frac{\rho_{3,m} \sigma_3}{\sigma_m} = \frac{(0.80) (20\%)}{15\%}$$

compared to Security 1 and Security 2 with beta values of 1.00 and 0.93, respectively.

17. B is correct. Security 2 has the lowest beta value;

$$0.93 = \frac{\rho_{2,m} \sigma_2}{\sigma_m} = \frac{(0.70) (20\%)}{15\%}$$

compared to Security 1 and 3 with beta values of 1.00 and 1.07, respectively.

18. B is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the intercept, α_i and slope coefficient, β_i , are estimated using historical security and market returns.

19. B is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the slope coefficient, β_i , is an estimate of the asset's systematic or market risk.

20. A is correct. In the market model, $R_i = \alpha_i + \beta_i R_m + e_i$, the intercept, α_i and slope coefficient, β_i , are estimated using historical security and market returns. These parameter estimates then are used to predict firm-specific returns that a security may earn in a future period.

21. B is correct. The average beta of all assets in the market, by definition, is equal to 1.0.

22. A is correct. The CAPM shows that the primary determinant of expected return for an individual asset is its beta, or how well the asset correlates with the market.

23. A is correct. If an asset's beta is negative, the required return will be less than the risk-free rate in the CAPM. When combined with a positive market return, the asset reduces the risk of the overall portfolio, which makes the asset very valuable. Insurance is an example of a negative beta asset.

24. B is correct. In the CAPM, the market risk premium is the difference between the return on the market and the risk-free rate, which is the same as the return in excess of the market return.

25. B is correct. The security market line (SML) is a graphical representation of the capital asset pricing model, with beta risk on the x-axis and expected return on the y-axis.

26. B is correct. The security market line applies to any security, efficient or not. The CAL and the CML use the total risk of the asset (or portfolio of assets) rather than its systematic risk, which is the only risk that is priced.

27. B is correct. The expected return of Security 1, using the CAPM, is $12.0\% = 3\% + 1.5(6\%)$; $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$.

28. B is correct. The expected risk premium for Security 2 is 8.4%, $(11.4\% - 3\%)$, indicates that the expected market risk premium is 6%; therefore, since the risk-free

rate is 3% the expected rate of return for the market is 9%. That is, using the CAPM, $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$, $11.4\% = 3\% + 1.4(X\%)$, where $X\% = (11.4\% - 3\%)/1.4 = 6.0\% = \text{market risk premium}$.

29. C is correct. Security 3 has the highest beta; thus, regardless of the value for the risk-free rate, Security 3 will have the highest expected return:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

30. C is correct. Security 3 has the highest beta; thus, regardless of the risk-free rate the expected return of Security 3 will be most sensitive to a change in the expected market return.

31. A is correct. The homogeneity assumption refers to all investors having the same economic expectation of future cash flows. If all investors have the same expectations, then all investors should invest in the same optimal risky portfolio, therefore implying the existence of only one optimal portfolio (i.e., the market portfolio).

32. B is correct. The homogeneous expectations assumption means that all investors analyze securities in the same way and are rational. That is, they use the same probability distributions, use the same inputs for future cash flows, and arrive at the same valuations. Because their valuation of all assets is identical, they will generate the same optimal risky portfolio, which is the market portfolio.

33. C is correct. The Sharpe ratio ($\widehat{SR}$) is the mean excess portfolio return per unit of risk, where a higher Sharpe ratio indicates better performance:

$$\widehat{SR}_1 = \frac{\bar{R}_p - \bar{R}_f}{\hat{\sigma}_p} = \frac{14.38 - 2.60}{10.53} = 1.12$$

$$\widehat{SR}_2 = \frac{\bar{R}_p - \bar{R}_f}{\hat{\sigma}_p} = \frac{9.25 - 2.60}{6.35} = 1.05$$

$$\widehat{SR}_3 = \frac{\bar{R}_p - \bar{R}_f}{\hat{\sigma}_p} = \frac{13.10 - 2.60}{8.23} = 1.28$$

34. C is correct. Jensen's alpha adjusts for systematic risk, and M^2 and the Sharpe Ratio adjust for total risk.
35. C is correct. The sign of Jensen's alpha indicates whether or not the portfolio has outperformed the market. If alpha is positive, the portfolio has outperformed the market; if alpha is negative, the portfolio has underperformed the market.
36. A is the correct. M^2 adjusts for risk using standard deviation (i.e., total risk).
37. A is correct. The security characteristic line is a plot of the excess return of the security on the excess return of the market. In such a graph, Jensen's alpha is the intercept and the beta is the slope.
38. B is correct. If the estimated return of an asset is above the SML (the expected return), the asset has a lower level of risk relative to the amount of expected return and would be a good choice for investment (i.e., undervalued).
39. C is correct. This is because of the plot of the excess return of the security on the excess return of the market. In such a graph, Jensen's alpha is the intercept and the beta is the slope.

40. C is correct. Since managers are concerned with maximizing risk-adjusted returns, securities with a higher value of Jensen's alpha, α_i , should have a higher weight.
41. C is correct. Since managers are concerned with maximizing risk-adjusted returns, securities with greater nonsystematic risk should be given less weight in the portfolio.

Corporate Issuers

LEARNING MODULE

1

Organizational Forms, Corporate Issuer Features, and Ownership

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	compare the organizational forms of businesses
☐	describe key features of corporate issuers
☐	compare publicly and privately owned corporate issuers

INTRODUCTION

1

This learning module introduces the Corporate Issuers topic area, which covers the fundamentals of how corporations are organized and governed and how they make operating, investing, and financing decisions. Financial analysts must have a strong understanding of corporate issuers because they are the largest type of issuer in financial markets globally; many analysts are focused entirely on analyzing and investing in their debt or equity instruments. In the first lesson of this module, we describe and compare the legal organizational forms of businesses, emphasizing their similarities and differences and important implications for investors. The second lesson focuses on the corporate organizational form and its key features, such as the separation of ownership and management, limited shareholder liability, access to financing, and tax issues. In the final lesson, we compare privately held and public corporate issuers, including the mechanisms of how corporate issuers go public and are taken private.

LEARNING MODULE OVERVIEW



- Businesses are legally organized as sole proprietorships, partnerships, or limited companies, which differ by several attributes, including legal identity, owner–manager relations, owner liability, taxation, and access to financing. In practice, organizational forms are jurisdiction specific; our focus is on common characteristics.
- The limited company form, often known as the corporation, offers advantages over the other two forms by improving the ability to raise capital, through limited shareholder liability, the separation of ownership and management, and fewer restrictions on the number of

owners and transferring ownership. In most jurisdictions, there are two types of limited companies: private limited companies and public limited companies.

- Private limited companies tend to have some restrictions on ownership but pass-through taxation like partnerships. Public limited companies have no ownership restrictions, but their income can be taxed at both the company and shareholder level. While public limited companies do not have to go public by selling their shares on an exchange, it is this form that is most suitable for becoming a publicly traded company.
- Corporate shareholders elect a board of directors that appoints executive management to operate the company. Shareholders effect change primarily through their ability to replace directors.
- Corporations that seek external financing in financial markets, known as corporate issuers, can utilize either public or private markets, and these choices have implications for the liquidity and price transparency of the company's securities, as well as its ability to raise future financing and the degree to which it must disclose information.
- Corporate issuers can change their status from privately held to publicly traded (or "listed") through a variety of mechanisms, including an initial public offering. Publicly traded issuers can be taken private through several mechanisms, including a leveraged buyout.
- Shareholders of corporate issuers include not only individuals and institutional investors, such as pension funds and mutual funds, but also governments, non-profits, and other corporations.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this topic.

1. Fill in the two blanks below using the two of the following four possible terms:

Sole proprietorship

General partnership

Limited partnership

Public limited company (corporation)

A _____ likely has the greatest access to financing, while a _____ likely has the least access to financing.

Solution:

A public limited company (corporation) likely has the greatest access to financing, while a sole proprietorship likely has the least access to financing. A primary difference across organizational forms is access to financing to fund investments. The sole proprietorship is limited to its individual owner's ability to invest her own money and borrowing capacity as an individual. At the other end of the spectrum, a public limited company can access a broad array of outside investors by issuing debt and/or equity securities.

2. Which of the following organizational forms provides for the *least* owner liability of business debts?

- A. General partnership
- B. Private limited company
- C. Sole proprietorship

Solution:

B is correct. In both the sole proprietorship and general partnership forms of organization, the owners are personally liable for all debts assumed by the company. In a private limited company, owner (shareholder) liability is limited to the value of their ownership stake.

3. Voting rights of a corporate issuer's shareholders generally refer to which of the following?

- A. The ability of the corporation to vote in political elections
- B. The direct ability to elect a chief executive officer of the company
- C. The ability to elect members of the company's board of directors

Solution:

C is correct. The voting rights of shareholders generally allow them to elect board members as well as vote on other matters outlined in the company's charter. The board of directors has the responsibility to hire (or retain) the company's chief executive officer (CEO); thus, voting rights do not give shareholders the *direct* ability to hire the CEO. Despite the status of a corporation as a distinct legal entity, this status does not provide voting rights in political elections.

4. Explain how the following situation reflects double taxation on the corporate organizational form: The corporation pays a 21% tax rate on pre-tax income of USD100 million. The corporation distributes USD10 million to its shareholders. Individuals pay a 20% tax on dividend income.

Solution:

The corporation pays USD21 million in income taxes at the corporate level and, collectively, the shareholders pay USD2 million in individual income taxes on dividends received. In total, USD23 million in income taxes were paid on the pre-tax income of USD100 million. Effectively, the USD10 million paid as dividends was taxed twice, first as business income and again as personal income.

5. True or false: The term "public" for a public corporate issuer means that the company is wholly or partially owned by a government.

- A. True
- B. False

Solution:

B is correct. The statement is false because while a public corporate issuer could be owned partly by a government, this condition is not necessary. The term "public" refers only to the fact that a company's equity securities are traded on an exchange and thus are available for investment by the public.

6. Fill in the blanks:

A public company's shares can be exchanged on a _____,
while a private company's shares suffer from a lack of price
_____.

Solution:

A public company's shares can be exchanged on a stock exchange, while a private company's shares suffer from a lack of price transparency.

2

ORGANIZATIONAL FORMS OF BUSINESSES



compare the organizational forms of businesses

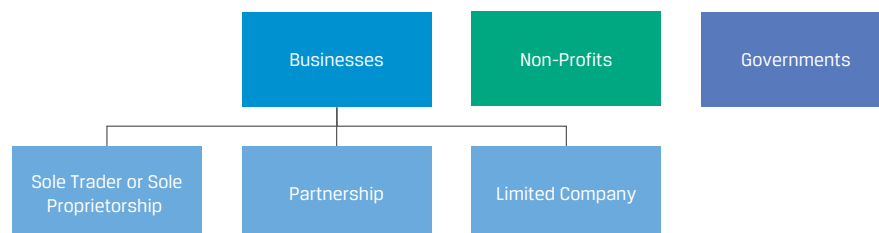
In most market economies, there are three general types of organization, each with distinct purposes, stakeholders, and governing legal frameworks: for-profit organizations, known as **businesses** or **companies**; not-for-profit non-governmental organizations, or simply non-profits; and governments.

The focus of this and subsequent modules are businesses, because financial analysts are important participants in the markets for their financial resources. However, non-profits and governments often are investors in businesses, which will be covered in later lessons. Governments as issuers of debt and other securities are covered in modules on fixed income.

Organizational Forms of Businesses

Business owners choose a legal **organizational form** that defines how returns, risks, and ownership and operational responsibilities are distributed. There are three general forms common to most jurisdictions.

Exhibit 1: Organizational Forms of Businesses



The organizational forms of businesses differ by several attributes:

- *Legal identity*: Whether the business is legally considered a separate entity or person apart from its owners
- *Owner–manager relationship*: The relationship between the owner(s) of the business and those who manage the business

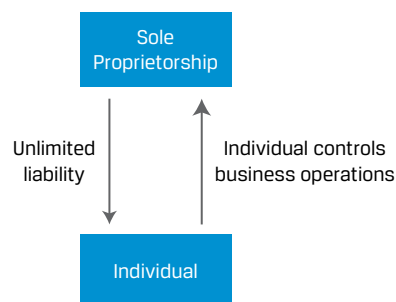
- *Owner liability:* The extent to which owners are personally legally liable for actions or debts undertaken by the business
- *Taxation:* The treatment of business profits or losses for tax purposes
- *Access to financing:* The ability to raise capital to fund expansion and distribute risks

Every jurisdiction has its own specific versions and variants of organizational forms, including different names for them. We are not attempting to provide an exhaustive treatment of jurisdictional specifics; rather, we provide the general and common attributes that analysts must know to ask the right questions in their own research on specific investment candidates and business cases.

Sole Trader or Proprietorship

The simplest organizational form is the sole trader or proprietorship, shown in Exhibit 2. In a sole proprietorship, the owner provides the capital needed to start and operate the business and retains full control over management, while participating fully in the firm's financial returns and risks. In some jurisdictions, this form is the default form, requiring no formal legal registration, and is dissolved when the owner ceases business activity or dies.

Exhibit 2: Sole Trader or Proprietorship



An example of a sole proprietorship is a family-owned business. The individual owner usually uses savings or a personal loan to start the business and to run daily operations and retains full management control. The owner retains all return (profits), which is taxed as personal income, and is personally responsible for losses and obligations of the business, such as debts.

While sole proprietorships comprise the largest *number* of businesses in most market economies and are preferred by small business owners for their simplicity and flexibility, their growth is constrained by an owner's ability to access financing, assume risk, and serve as the sole owner.

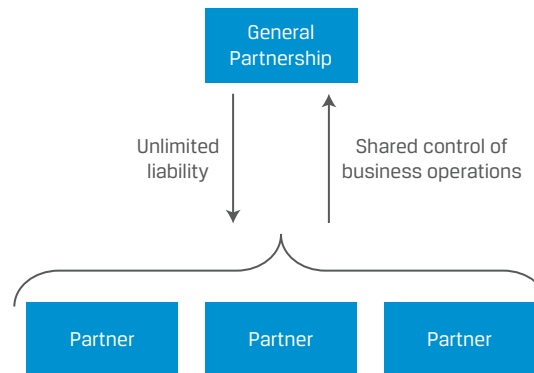
Partnerships

Partnerships allow multiple owners to pool their resources and share business risk and return. There are three common types in most jurisdictions: general partnerships, limited partnerships, and limited liability partnerships.

A **general partnership**, shown in Exhibit 3, has two or more owners called partners or **general partners (GPs)**. General partnerships are like sole proprietorships, with the important distinction that they allow for additional resources to be brought into the

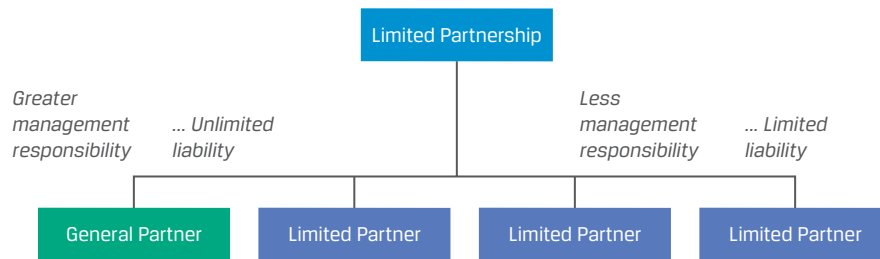
business by the additional owners, along with the sharing of business risk and return. Partnerships are often formed and governed by a written partnership agreement that outlines specific partner roles and responsibilities and the sharing of profits, losses, and obligations. However, a written agreement is not required; partnerships can be formed verbally or incidentally through actions.

Exhibit 3: General Partnership



Examples of general partnerships include service businesses, such as builders or contractors, and joint ventures of multiple businesses. Such businesses have a small number of partners who usually contribute equal or similar amounts of capital. The partners bring complementary expertise, such as expertise in business development, financial acumen, operations, or legal/compliance, and they share responsibility in running the business. All profits, losses, and risks of the business are collectively assumed and shared by the partners. If one partner is unable to pay his share of the business's debts, the remaining partners are fully liable. As with a sole proprietorship, potential for growth is limited by the partners' ability to source financing and expertise and their collective risk tolerance because the partners are still personally liable for business losses and debt.

Exhibit 4 shows a type of partnership called a **limited partnership**, which addresses some of the shortcomings of general partnerships. In a limited partnership, there must be at least one general partner (GP) with unlimited liability that often manages the business. Remaining partners, however, called **limited partners (LPs)**, have limited liability, meaning their losses are limited to the size of their investment in the limited partnership, and may not have any management responsibilities. With limited liability, personal assets are considered separate and thus protected from the obligations of the business. All partners are entitled to a share of the profits and losses as specified in the partnership agreement, with GPs typically receiving a larger portion in exchange for their greater risk and personal liability. Partnership agreements are customized and negotiated by the partners and can be highly complex, with multiple partnership tiers that have varying profit and loss sharing arrangements.

Exhibit 4: Limited Partnership

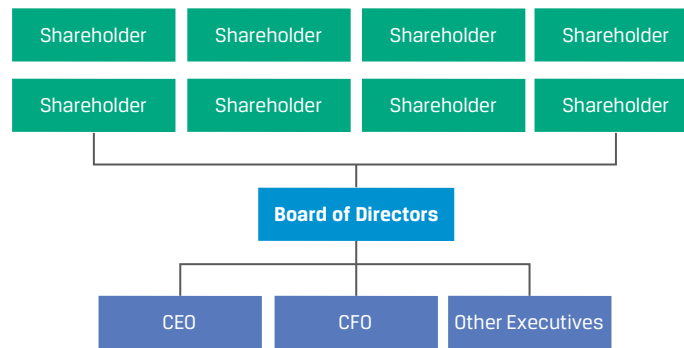
In a limited partnership, while financial risk and reward are shared, such resources as capital and expertise are typically limited to what the partners can contribute, and limited partners usually grant managerial responsibilities to the GP, which entails risk. Partnership agreements are customized and often limit the transferability of ownership interest or expansion beyond a small group of partners. Like sole proprietorships, partnerships are typically **pass-through businesses** for tax purposes. Pass-through businesses are not taxed at the entity level, passing on all their profits or losses to the partners who are taxed personally. Business income from these entities is passed through and taxed regardless of whether income was actually distributed or retained in the partnership and reinvested.

In some jurisdictions, there is a special form of limited partnership known as a **limited liability partnership (LLP)**, which does not require a general partner and is instead composed entirely of limited partners, thus resolving the risk of unlimited liability for the GP. Instead, all partners have limited liability, and the partners share in management responsibilities, typically appointing one or more partners as managing partners. In some jurisdictions, such as the United States, LLPs are permitted only for professional services firms, such as law, accounting, engineering, and architecture, and have limits on the number of partners and legal restrictions on equity investment.

Limited Companies

Finally, a **limited company** has many similarities to limited partnerships but includes several more features that allow greater access to financing and expertise for growth. In many jurisdictions, there are two types of limited companies: private limited companies and public limited companies.

The **private limited company** is similar to a limited partnership. But the form includes limited liability for *all* owners, improved transferability of ownership interests by dividing ownership into units called **shares** that are more easily tradeable, and a distinction between owners and managers. Owners, known as **shareholders** or members, elect a **board of directors** to manage the company and authorize any distributions of profits to owners. Boards of directors typically appoint professional managers. Private limited companies are known by many names in different jurisdictions, including limited liability company (LLC) and S corporation in the United States, G.K. in Japan, SARL in France, GmbH in Germany, and company with limited liability in China.

Exhibit 5: Organization of Limited Company

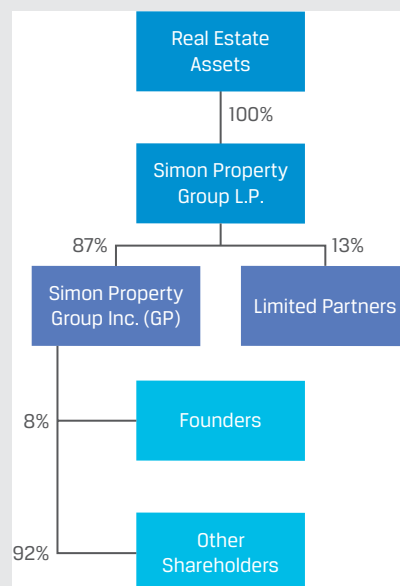
In many jurisdictions, including the United States, private limited companies have legal limits on the number of owners and require votes for transferring ownership interest but are pass-through businesses (like LPs), meaning that taxes on business income are paid only at the shareholder, not company, level.

Finally, **public limited companies**, often called **corporations**, are similar to private limited companies but in most jurisdictions face no legal restrictions on the number of owners or ownership transferability, while still featuring limited liability and separation of ownership and management. For these reasons, public limited companies are the most suitable form for companies that seek to go public and are the dominant organizational form globally by revenues and asset values. However, public limited companies are disadvantaged in most jurisdictions compared to the other organizational forms in one respect: taxation. While other forms are taxed only on business income and loss at the owner (personal) level, public limited companies are taxed at the business level and *again* at the personal level if profits are distributed to shareholders. But if profits are retained and reinvested in the company, the shareholder level of tax does not apply, which makes this organizational form more suitable for companies intending to retain profits to fund investment.

Public limited companies are known by different names in different jurisdictions, including C-corporation in the United States, corporation in China, Société anonyme in France, AG in Germany, and K.K. or stock company in Japan. Examples are numerous, including most if not all well-known multinational companies.

EXAMPLE 1**Simon Property Group**

Simon Property Group (“Simon”) is one of the largest owners of retail real estate in the world, with over \$33 billion in assets. Its assets primarily include shopping centers in the United States and some retail properties in Europe and Asia. Simon is organized in two layers, each with a distinct organizational form.



The retail real estate assets are wholly owned by Simon Property Group L.P., a limited partnership. Its partners include Simon Property Group Inc., the general partner, and approximately 200 limited partners. The general partner has full managerial responsibilities and unlimited liability and has an ownership interest of 87% in the partnership.

Importantly, the general partner, Simon Property Group Inc., is itself a corporation. It is broadly owned by thousands of shareholders, including the founding family, which owns 8% of shares. Simon Property Group Inc. has a single asset: its partnership interest in Simon Property L.P.

Simon's structure allows co-investing with limited partners, full management control, and receiving most of the income from the assets, while benefiting from broad access to financing, because while the GP has unlimited liability, its *shareholders* have limited liability. Partnerships composed of entities with limited liability, such as corporations, are common because they shield the ultimate owners (in this case, shareholders of Simon Property Group Inc.) from business risk but allow for the sharing of profit and loss in the underlying business.

The key distinctions between sole proprietorships, partnerships, and public limited companies or corporations are outlined in Exhibit 6.

Exhibit 6: Features of Sole Proprietorships, Partnerships, and Corporations

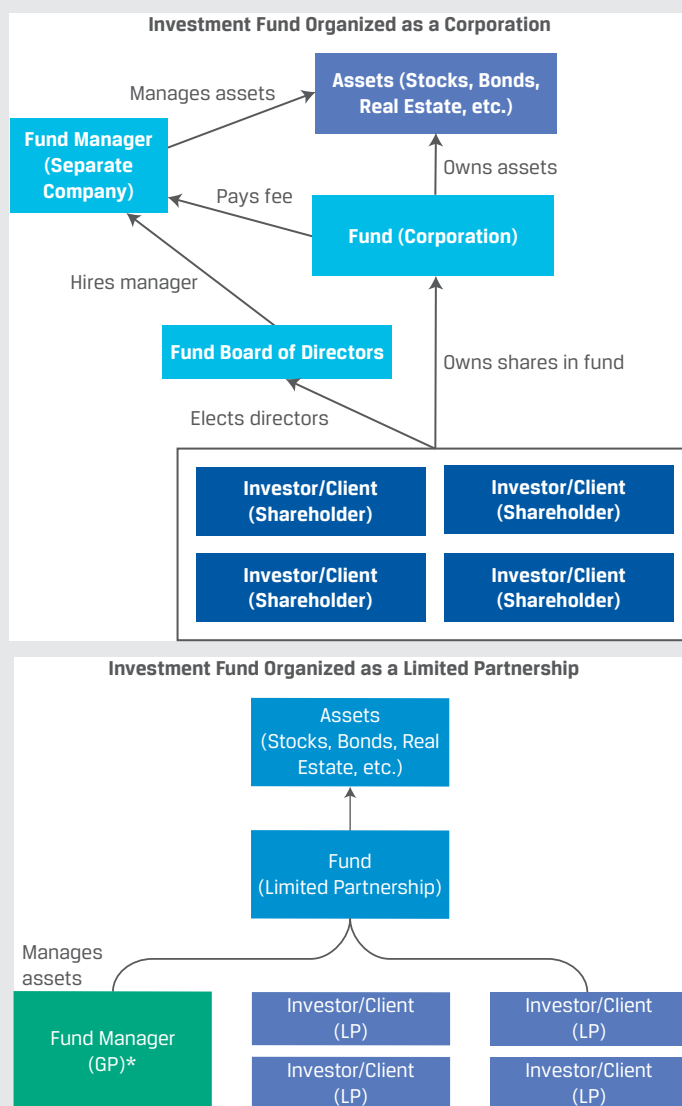
Feature	Sole Proprietor	General Partnership	Limited Partnership	Corporation
Legal Identity	No separate legal identity; extension of owner	No separate legal identity; extension of partner(s)	No separate legal identity; extension of partner(s)	Separate legal entity
Owner–Operator Relationship	Owner operated	Partners operated	GP operated	Board and management operated
Owner Liability	Sole unlimited liability	Shared unlimited liability	GP has unlimited liability; LPs have limited liability	Limited liability

Feature	Sole Proprietor	General Partnership	Limited Partnership	Corporation
Taxation	Pass-through: Profits taxed as personal income	Pass-through: Profits taxed as personal income	Pass-through: Profits taxed as personal income	Corporation income taxed; distributions (dividends) taxed as personal income
Access to Financing	Limited by owner access to capital	Limited by partner access to capital	Limited by GP/LP access to capital	Unbounded access to capital, unlimited business potential

EXAMPLE 2**How Are Investment Funds Organized?**

Investment funds are pools of capital contributed by one or more investors for earning returns and managing risks. Investment funds are like other companies in a market economy: They hire professional management to invest capital, sometimes with additional borrowed money, in various assets to achieve return objectives subject to risk constraints. Major differences between funds and other companies include employing few people directly, primarily investing in financial instruments rather than operating assets, diversification of assets, and having specific rather than general objectives (e.g., exceed a benchmark rate of return).

Two common organizational forms for investment funds are corporations and limited partnerships, as illustrated in the following two diagrams. When organized as a corporation, fund investors hold shares that represent their proportionate interests in the pool of underlying assets. When organized as a limited partnership, fund investors hold partnership units that either represent their proportionate interests in the pool of underlying assets or varying interests of specific assets.



*In this structure, which will be discussed in greater detail later in the curriculum in lessons on alternative investment, fund managers typically create a wholly owned private limited company entity that serves as the GP to protect the fund manager from unlimited liability.

QUESTION SET



1. Identify two features that distinguish a general partnership from a limited partnership.

Solution:

Owner–manager relationship: The management of a general partnership is typically shared by the general partners, while in a limited partnership, the general partner often exercises most managerial responsibilities.

Owner liability of business debts and obligations: In a general partnership, the partners are personally legally liable for business debt and actions undertaken by the company. In a limited partnership, only the general partner faces personal liability; limited partners' liability is limited to their investment in the partnership.

2. Match the following business attributes with the most appropriate organizational form.

Business Attribute	Organizational Form
A. Significant capital needs	1. Limited liability partnership
B. Single owner, desires simplicity	2. Corporation
C. Company provides professional services	3. Sole proprietorship

Solution:

- A. 2. Corporation
 B. 3. Sole proprietorship
 C. 1. Limited liability partnership

A company with significant capital needs will want broad access to financing. In such a case, the corporate organizational form likely is most appropriate.

For the single owner who desires simplicity, a sole proprietorship is a suitable mechanism. In some jurisdictions, it is the “default” organizational form and does not require registration.

Professional service companies, such as a law firm, require the owners to have the skill sets to manage the company. A partnership structure is suitable, and a limited liability partnership structure allows for the partners to share managerial control without any partner assuming unlimited liability.

3. If a company owner expects to have a significant need for financing, which of the following organizational forms is the *least* appropriate choice?

- A. Corporate
 B. Partnership
 C. Sole proprietorship

Solution:

C is correct. A sole proprietorship is limited in financing to the owner’s funds and by the amount the owner can borrow personally. A partnership expands access to financing by adding owners, spreading risk, and adding borrowing capacity. The corporate form provides for the broadest access to financing because there are no limits to the number of shareholders and, with limited liability, shareholders are relatively more comfortable with the company borrowing.

4. Fill in the blanks in the following sentence:

_____ liability is a benefit to the corporate organizational form, but the form does face a possible disadvantage because of _____ taxation of distributed business income.

Solution:

Limited liability is a benefit to the corporate organizational form, but the form does face a possible disadvantage because of double taxation of distributed business income.

5. True or False: Partnerships are typically taxed at the entity level rather than at the individual partner level.

A. True

B. False

Solution:

B is correct. Partnerships are typically pass-through entities, meaning that business income earned by the partnership is passed through to the partners according to the terms of partnership agreement, and each partner is taxed at the personal level.

KEY FEATURES OF CORPORATE ISSUERS

3



describe key features of corporate issuers

The prior lesson addressed several advantages of the corporate organizational form over others, such as limited owner liability, owner–manager separation, and improved access to external financing. In this lesson, we explore the features of corporations in greater depth. Corporations that raise capital in the financial markets, known as **corporate issuers**, are essential for financial analysts to understand, because they raise more capital from investors than even governments worldwide.

Legal Identity

A corporation is a legal entity separate and distinct from its owners formed through the filing of articles of incorporation with a regulatory authority. Corporations share many of the rights and responsibilities of an individual and may engage in similar activities. For example, a corporation can enter into contracts, hire employees, sue and be sued, borrow and lend money, make investments, and pay taxes.

Large corporations frequently have business operations in many different geographic regions and are subject to each regulatory jurisdiction where

- the company is incorporated,
- the business is conducted, and
- the company finances itself

and for such activities as

- registration,
- financial and non-financial reporting and disclosure, and
- capital market activities (issuance, trading, investment).

Owner–Manager Separation

A key feature of most corporations is the separation between those who own the business (the shareholders) and those who operate it, as represented by the board of directors and management. In a corporation, shareholders are largely removed from the

day-to-day operations of the business. Instead, shareholders elect a board of directors that, in turn, appoints executive-level management, such as the chief executive officer, who is accountable for investing, financing, and operating decisions. Directors and managers have a primary responsibility to act in the best interest of shareholders and, indirectly, all stakeholders. The separation of ownership and management enables the corporation to obtain financing from a larger universe of potential investors who do not need (or want) to be involved in management.

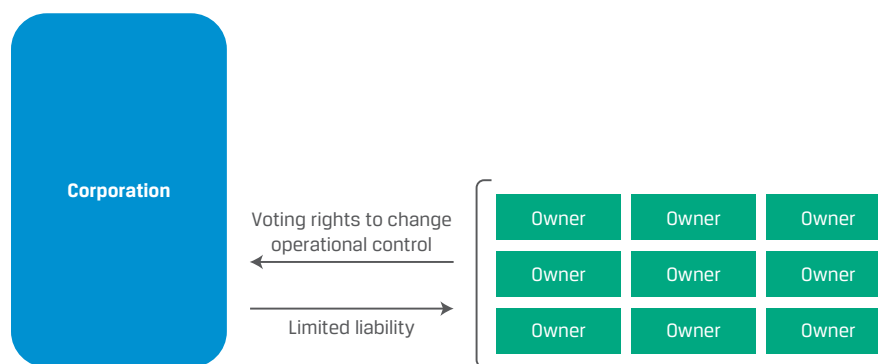
If a board or management does not act in shareholders' best interests, shareholders can enact change through exercising **voting rights** attached to their shares—for example, by voting to replace the board of directors—though this can take time. Influencing operations or changing management outright using engagement and voting rights is a strategy pursued by some investors and will be discussed in detail in later lessons.

Owner/Shareholder Liability

Risk is shared among all shareholders, who face limited liability. That is, the maximum amount shareholders can lose is what they have invested in the company (i.e., the value of their shares can fall to zero but no further), and they are not responsible for the debts of the corporation unless they separately, specifically guarantee them.

Shareholders share in the risk and return of the company in proportion to their share ownership unless the corporate charter specifies differently. Unlike partnerships, ownership units are divided into shares of smaller unit size, allowing investors to more easily purchase or sell ownership interests as represented by their shares. For example, some issuers have more than 1 billion shares outstanding, meaning that ownership interests are divided into extremely small increments. Additionally, some corporations issue multiple types or classes of shares with different risk and return characteristics, which will be discussed in a later lesson. Exhibit 7 shows the relationship between owners and the corporation.

Exhibit 7: Corporate Shareholder Liability



External Financing

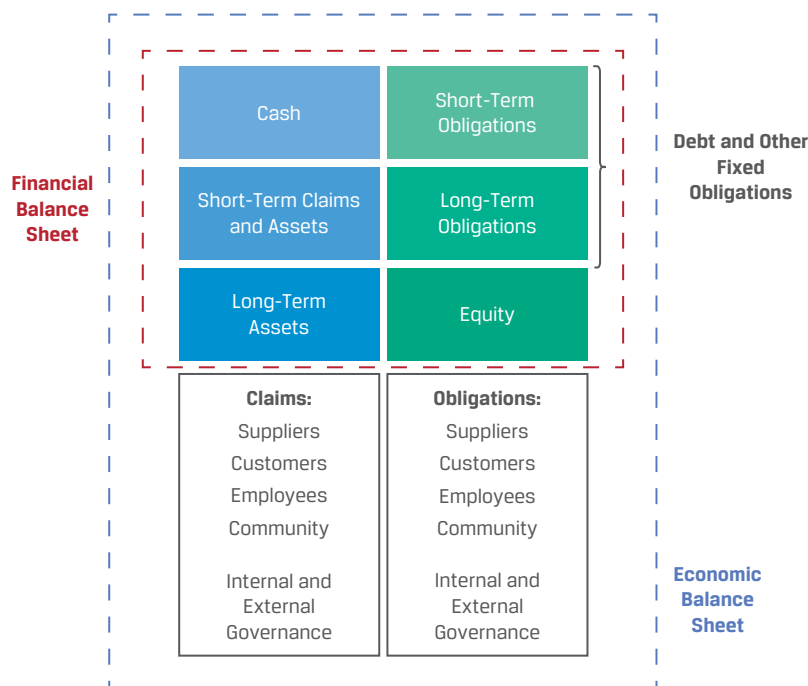
The separation between ownership and management allows corporations to access external financing more easily than other business structures because purchasing a share is the only requirement to become an owner. While more expensive to form and operate than other forms, the corporate form is typically preferred when capital needs

exceed what could be raised by an individual or small group of partners. Financing may be provided by individuals or by institutions, such as mutual funds, pension funds, banks, governments, non-profits, and other corporations.

Corporations are financed in two ways: with **equity**, by selling shares to investors or reinvesting profits, and with borrowings, or **debt**, in the form of loans, bonds, and leases. Equity investors (shareholders) have a right to receive any distributions of profits, known as **dividends**, while debt must be repaid on a pre-specified date in the future with interest. Equity or debt financing can be raised based on a private contractual agreement between an issuer and investors or in the form of a **security**, a standardized instrument that might be tradeable among investors on a public exchange, which will be covered in the next lesson.

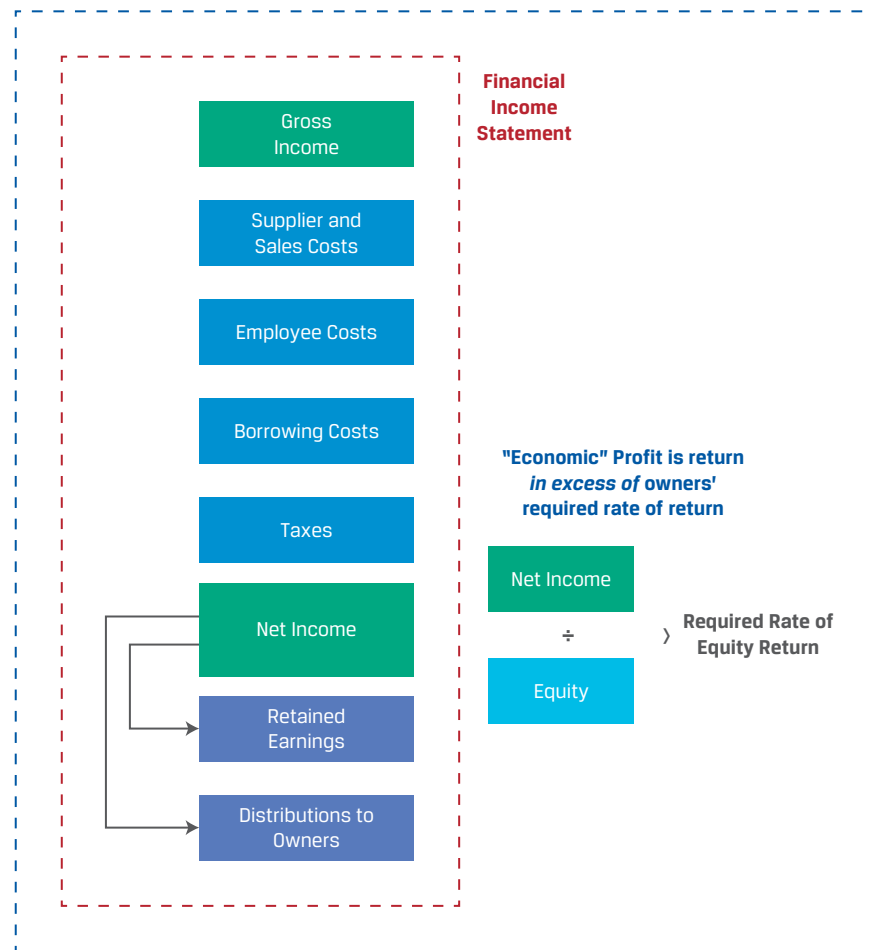
Exhibit 8 shows the relationship between debt and equity on a corporation's balance sheet and how these are related to its assets.

Exhibit 8: Financial and "Economic" Balance Sheet



While the "financial" balance sheet at the top of Exhibit 8 shows an issuer's assets (left-hand side) and its sources of financing (right-hand side) from short term to long term measured in financial terms, other intangible or hard-to-quantify assets or liabilities of a firm, such as the human capital associated with its employees and supplier and customer relationships, are included on what may be referred to as an issuer's broader "economic" balance sheet.

Similarly, Exhibit 9 shows an issuer's income statement and distinguishes between its financial income or net income once fixed obligations have been met and its "economic" profit, or return to a firm's owners in excess of what they could have earned elsewhere on different investments, known as their required rate of return on equity.

Exhibit 9: Financial and "Economic" Income Statement

Taxation

While taxation for corporations can differ greatly from country to country, the corporation is ultimately subject to the tax authority and tax code governing the issuer's tax reporting, payment, and status. In most countries, corporations are taxed on their profits. Taxable profits are usually *not* the same as profits reported on financial statements, because tax codes and accounting standards differ.

In many countries, shareholders pay an additional tax on distributions (dividends) that are passed on to them. This is referred to as the **double taxation** of corporate profits. In some countries, shareholders do not pay a personal tax on dividends if the corporation has paid tax previously on the earnings distributed to shareholders or shareholders receive a personal tax credit for their proportional share of taxes paid by the corporation. In other countries, corporations pay no tax at all or may face different tax regimes within one country.

EXAMPLE 3**Double Taxation of Corporate Profits**

1. The French retail giant Auchan Holding generated pre-tax income of €838 million last year and paid corporate taxes of €264 million. Investors in France also pay a 30% tax on dividends received. If Auchan had fully distributed its after-tax income to investors as a dividend and all its investors are in France, what is the total tax rate as a percentage of Auchan's pre-tax income?

Solution:

Pre-Tax Income	€838
Corporate Taxes (31.5%)	€264
After-Tax Income	€838 – €264 = €574
Distributed Dividend	€574
Investor Dividend Tax (30%)	€574 × 0.30 = €172.2
Total Tax Rate	(€264 + €172.2)/€838 = 52.1%

If the after-tax income of €574 million were paid to investors as a dividend, investors would pay €172.2 million in personal taxes on the dividends received. Total taxes paid would be €436.2 million (€264 million at the corporate level plus €172.2 million at the personal level), resulting in a total tax rate of 52.1%.

Despite the tax disadvantage illustrated in the prior example, the corporate form remains attractive for several reasons. While corporate shareholders are taxed on distributions, sole proprietors and partners are often taxed on all profits regardless of whether they are distributed as dividends (exceptions exist with allowances for profit reserves). This difference makes the corporate structure attractive to businesses that expect to reinvest undistributed profits in, for example, additional capacity for growth. Also, in jurisdictions where corporate tax rates are lower than personal income tax rates, it can be advantageous to “store” profits in the business.

QUESTION SET

1. Explain why the separation of ownership from management allows for corporate issuers to have greater access to capital.

Solution:

By separating ownership from management responsibilities, corporations can attract a broad range of owners, especially individuals and institutions, who do not want to be involved in management but would like to participate as investors.

2. Fill in the blanks in the following sentence:

Limited liability of shareholders refers to the fact that the _____ amount shareholders may lose on their investment is the _____ paid to buy the shares.

Solution:

Limited liability of shareholders refers to the fact that the maximum amount shareholders may lose on their investment is the price paid to buy the shares.

3. In which of the following situations does the double taxation of the corporate organizational form matter the *least*?

- A. The company expects to pay all its after-tax income as a dividend to shareholders each year.
- B. The company's shareholders reside in a tax jurisdiction with a high tax rate on dividend income.
- C. The company is expecting to reinvest all its after-tax profits each year into growth of the business.

Solution:

C is correct. Reinvestment of all profits implies that the company pays no dividend to shareholders, and thus, no double taxation occurs.

A is incorrect. Double taxation occurs because dividend income is taxed at both the corporate level and the shareholders' personal levels. If all after-tax profits are distributed, shareholders are taxed twice on the business's income.

B is incorrect because a high tax rate on shareholders' dividend income received would be a strong impetus to retain profits, find alternative means of distributing profits, or change the organizational form.

4. Referring to the Auchan Holding example in this lesson, calculate the amount of the tax disadvantage (in euros) Auchan has in its corporate form compared to if it were organized as a limited partnership. Recall that Auchan's pre-tax profit was €838 million, the corporate tax rate was 31.5%, the personal income tax rate was 30%, and all after-tax profits were distributed.

Solution:

If Auchan were organized as a limited partnership, its pre-tax profit would be passed through to the owner(s) and taxes would only be paid at the personal level. Thus, total taxes paid would be €251.4 million (= €838 million $\times$ 0.30), or €184.8 million lower than total taxes paid under the corporate organizational form, and this tax of €251.4 million would be paid regardless of whether the partnership distributed the profit to partners.

5. Corporate issuers are characterized by all of the following *except*:

- A. Corporate income is taxed at both the corporate and personal levels.
- B. Owners do not need to be involved in management of the company.
- C. The owners of the corporation are not legally distinct from the corporation.

Solution:

C is correct. A corporation is a legally separate entity from its owners.

A is incorrect because corporate income is taxed at both the corporate and personal levels unless the company pays zero dividends.

B is incorrect because shareholders are not required to exercise management control over the company. While in some cases, a large shareholder may serve as senior management or be on the board of directors, most shareholders do not take on management responsibilities.

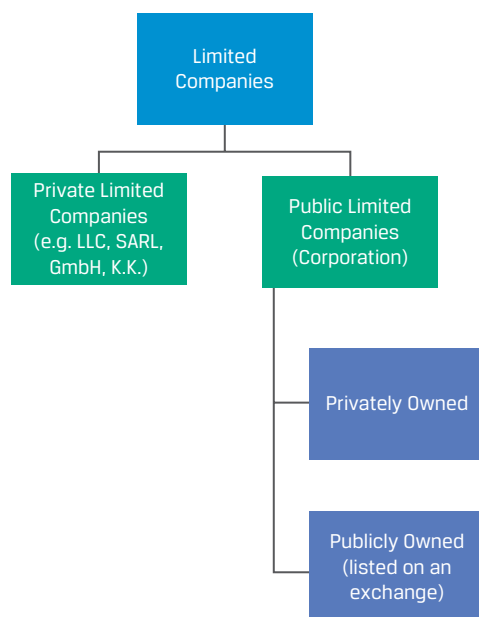
PUBLICLY VS. PRIVATELY OWNED CORPORATE ISSUERS

4

☐ | compare publicly and privately owned corporate issuers

For corporations, “public” and “private” (or “listed” and “unlisted”) are often defined by whether the company’s shares are listed and tradeable on an **exchange**. Somewhat confusingly, this is different from the discussion of private and public limited companies in an earlier lesson; most public or listed companies are public limited companies, but public limited companies are not obliged to list their shares on an exchange.

Exhibit 10: Publicly vs. Privately Owned Limited Companies



An exchange, which for equities is referred to as a **stock exchange**, is a rules-based, open access market venue where financial instruments are traded, with price and volume transparency accessible by issuers, investors, and their intermediaries. In addition to an exchange listing, primary features distinguishing public and private companies include

- the ability to transfer ownership between investors,

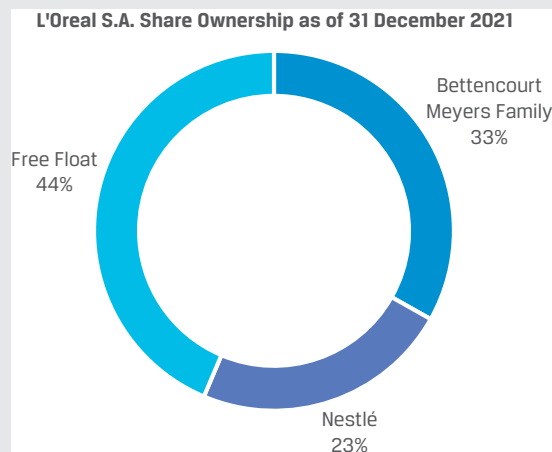
- the process of issuing new shares, and
- registration and disclosure requirements.

A **public (listed) company** has some or all of its shares listed and traded on an exchange. These shares may be widely held or involve a majority or controlling owner. Shareholders may include individuals, employees, institutions on behalf of individuals (e.g., pension funds), other corporations, governments, and non-profits. The shares that are traded actively—and thus are not held by insiders, strategic investors, or sponsors but are more freely available on exchanges—are known as an issuer's **free float**. Free float is often expressed as a percentage of total shares outstanding.

EXAMPLE 4

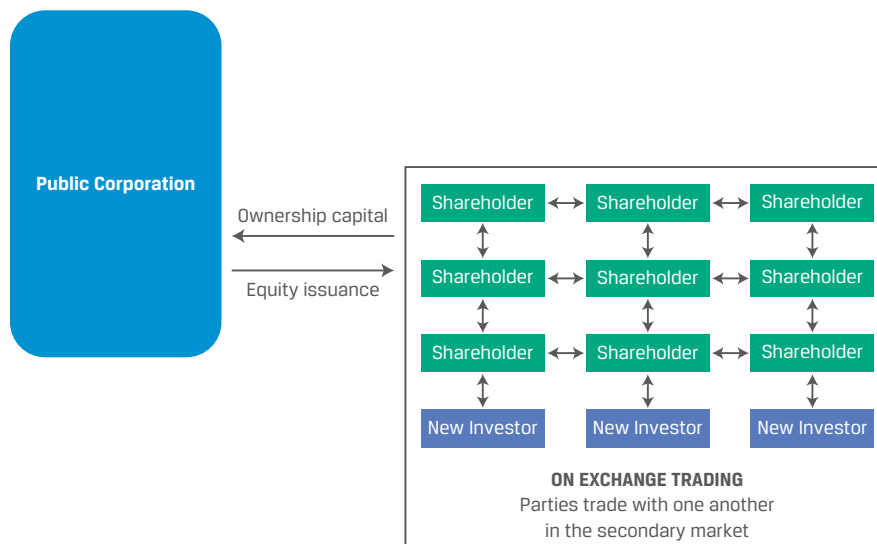
L'Oréal S.A., the world's largest beauty company, is a French société anonyme, or public limited company. It has been public since listing its shares on the Paris Stock Market (now Euronext) in 1963. As of 31 December 2021, L'Oréal had approximately 535 million shares outstanding.

L'Oréal's shares are mostly owned by Francoise Bettencourt Meyers, her family, and Nestlé (a large, listed Swiss consumer goods company), and the remainder—the free float, approximately 44% of shares—is owned by institutional investors, individual investors, and L'Oréal employees.



Exchange Listing, Liquidity, and Price Transparency

An exchange listing allows ownership to be more easily transferred because investors transact directly with one another in the secondary market on the exchange. An investor can become a shareholder in a public company by executing a buy order in a brokerage account or reduce an ownership position by executing a sell order. This can be done immediately for a relatively small number of shares in a liquid stock or take longer for many shares in a company whose shares trade infrequently. An exchange listing provides share price transparency, allowing investors to track how a company's value changes.

Exhibit 11: Public Companies—Share Ownership Transfer

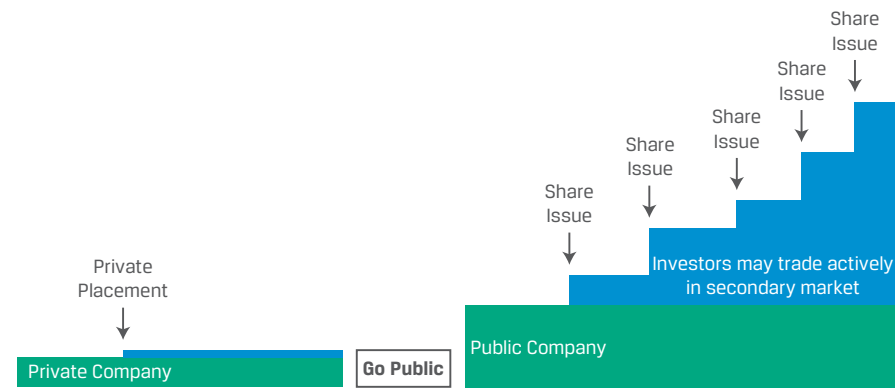
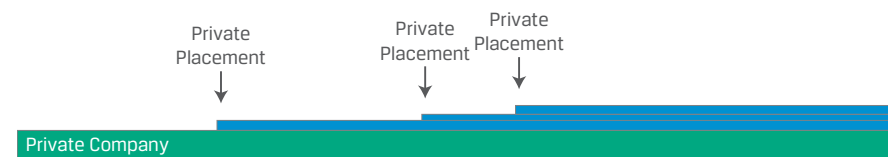
In contrast, the shares of a **private company** are not listed (do not trade on an exchange), so no visible company valuation or share price transparency exists. This makes ownership transfer between investors far more difficult than for a public company. A private company shareholder seeking to sell shares must find a willing buyer, and the two parties must negotiate a price. Even then, the company may refuse the transfer of ownership. Private company shareholders must exercise patience. Their investment is usually locked up until the company is acquired for cash or shares by another company or it goes public.

Private companies do, however, provide benefits that may outweigh the downside of limited transferability of shares. Private companies typically have fewer shareholders, meaning that controlling owners and management are accountable to fewer stakeholders. Second, many early-stage companies are private. If successful, an investor in their equity could earn high returns. Finally, private companies have few disclosure requirements, which are costly to comply with, and there are few regulations and costs associated with raising financing in private transactions. While some claim that private status results in improved performance from greater focus on the long term, as opposed to focusing on quarterly earnings and other short-term measures associated with listed companies, the empirical evidence for short-termism among listed companies is thin at best.¹

Share Issuance

Corporate issuers may issue additional equity shares in the capital markets from time to time. For a public issuer, these shares can be traded in the secondary market once they're issued. In contrast, private companies finance smaller amounts in the primary market (private debt or equity) from fewer investors who typically have longer holding periods. Exhibit 12 and Exhibit 13 illustrate differences in public and private company share issuance and relative size of financing.

¹ Mark J. Roe, "Stock Market Short-Termism's Impact," European Corporate Governance Institute (ECGI) Law Working Paper No. 426/2018, Harvard Public Law Working Paper No. 18-28 (22 October 2018).

Exhibit 12: Public Companies: Share Issuance and Financing Access**Exhibit 13: Private Companies Share Issuance and Financing Access**

Private company investors are typically invited to purchase shares in the company through a **private placement** whose terms are outlined in a legal document (public companies can also conduct private placements, subject to regulatory constraints). Private company investors may be limited to qualified or so-called **accredited investors** or **sophisticated investors**, or those deemed to be able and willing by regulatory authorities to assume the greater risk of a non-public offering.

Registration and Disclosure Requirements

Perhaps the defining attribute of public companies is transparency and disclosure. Public companies must register with a regulatory authority and are subject to compliance and reporting requirements. For example, companies with securities listed on US exchanges (e.g., NYSE and NASDAQ) must file audited financial statements and other information on a quarterly basis with the Securities and Exchange Commission (SEC), which are then accessible to the public on the SEC's EDGAR (Electronic Data Gathering, Analysis, and Retrieval) system or on the company's website. In the European Union, financial statements must be reported in the EU's standardized ESEF (European Single Electronic Format) in the registry of domicile, at least semiannually. Public companies' annual reports regularly exceed 100 pages.

Besides qualitative information and financial reports, public companies must also disclose major changes in the holding of voting rights and other information that may affect security prices, such as management and director stock transactions. Significant share purchases and sales by management may contain information for investors, such as management's confidence in exceeding expectations or leading to questions about a company's business strategy.

Private companies are generally not subject to the same level of regulatory disclosures, although many rules pertain to both private and public companies (such as prohibitions against fraud and the obligation to file corporate tax returns). While not required, some private firms disclose pertinent information directly to owners as well as lenders, especially if they hope to be able to raise additional financing in the future. Exhibit 14 and Exhibit 15 compare typical entity relationships for public and private companies.

Exhibit 14: Public Companies: Typical Entity Relationships

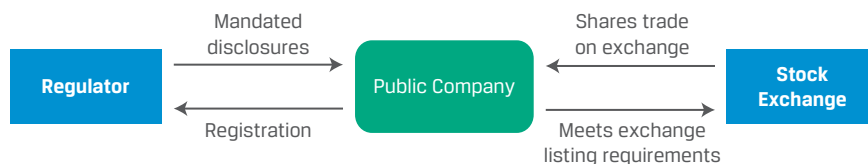
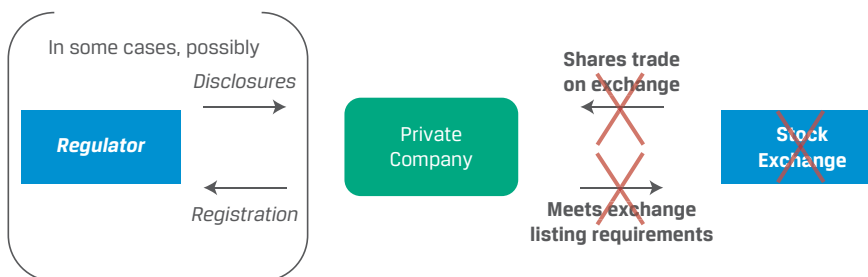


Exhibit 15: Private Companies: Typical Entity Relationships



KNOWLEDGE CHECK



1. Match the applicable company characteristic in the left column with the category that best describes it (publicly held, privately held, both) on the right).

Exchange listed	Publicly held/Private held/Both
Owner/manager overlaps	Publicly held/Private held/Both
Registered	Publicly held/Private held/Both
Share liquidity	Publicly held/Private held/Both
Non-financial disclosure required	Publicly held/Private held/Both
Negotiated debt and equity sales	Publicly held/Private held/Both

Solutions:

Exchange listed	Publicly held
Owner/manager overlaps	Privately held
Registered	Publicly held
Share liquidity	Publicly held
Non-financial disclosure required	Both
Negotiated debt and equity sales	Privately held

Publicly held companies are most often listed on exchanges and required to register shares. Their shares are typically liquid with minor ownership overlap between management and shareholders. These companies must make both financial and non-financial disclosures, and both their debt and equity are typically traded on exchanges. Privately held companies are neither exchange listed nor usually subject to registration requirements. Share issuance is less widely distributed, creating a greater chance of ownership overlap between management and shareholders. Private company shares are illiquid. Generally, these companies are required to make only non-financial disclosures. The sale of their equity and debt is privately negotiated between company insiders and capital providers.

Going from Private to Public

In the next example, we discuss a company's change from a private company to a public one.

EXAMPLE 5

The Story of Tesla

In 1997, engineer Martin Eberhard and computer scientist Marc Tarpenning started a company called NuvoMedia to make an electronic book reader called the Rocket eBook, a precursor to Amazon's Kindle. Three years after it was founded, NuvoMedia was sold for \$187 million.

Soon after, the two entrepreneurs formed a new company focused on making electric sports cars. They named the company Tesla Motors in honor of the inventor Nikola Tesla, forming a corporation in 2003. As a high-risk, capital-intensive endeavor, they used some of their new-found wealth and sought other cofounders with expertise in electric vehicles and fundraising capabilities. Elon Musk, an entrepreneur with a shared vision in the commercialization of electric sports cars, joined the team, as did Ian Wright and J. B. Straubel, the company's chief technical officer.

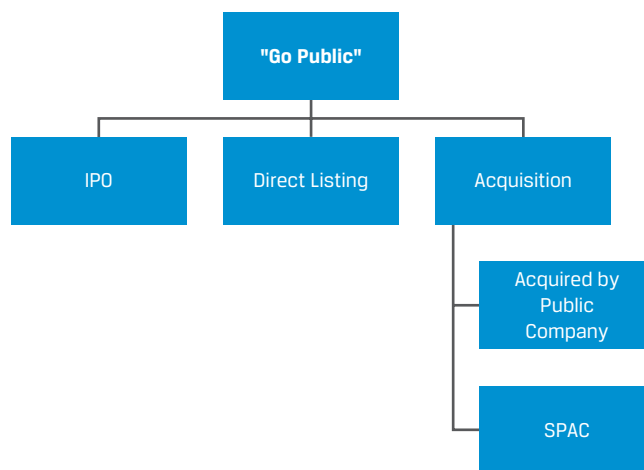
In addition to investing \$6.3 million in Tesla in 2004, making him the largest shareholder, Musk helped raise money from venture capitalists. Musk became CEO in 2008, the year Tesla released its first vehicle, the Roadster. In 2010, Musk led Tesla's initial public offering, which raised \$226 million. Over the next several years, Tesla shifted from sports cars to passenger vehicles, greatly expanding its vehicle production and product line, and in 2016, it also entered the photovoltaics market. In 2017, it changed its name from Tesla Motors to Tesla, Inc., to reflect its diversification into energy storage. The company continued global expansion

of automobile production, issuing several billion dollars in three secondary equity offerings in 2020. Tesla moved its headquarters from California to Texas and reached a \$1 trillion market capitalization in 2021.

The evolution of Tesla, Inc., over less than 20 years of existence from a startup to a firm among those with the largest market capitalization globally was assisted by the flexibility of its organizational form as a corporation. Tesla was able to obtain significant financing from both debt and equity investors and retain key employees, including Musk, with equity-based compensation.

Private companies may become public companies (“go public”) in three ways: IPO, direct listing, or acquisition.

Exhibit 16: Three Ways Private Companies Go Public



Tesla Motors became a public company using an **initial public offering (IPO)**. To complete an IPO, companies must meet specific exchange listing requirements and usually engage financial intermediaries known as investment banks to underwrite the sale of new shares. Proceeds from the sale of new shares go to the issuing corporation, and its shares begin trading on an exchange.

Private companies can also go public through a far less common method known as a **direct listing**, which differs from an IPO in two important ways. A direct listing does not involve an underwriter and no new shares are issued, so no capital is raised. Instead, the company simply lists existing shares on an exchange at a price determined by the market, and shares become available to the public as they are sold by existing shareholders. Although direct listings, compared with IPOs, may take place more quickly and at a lower cost, they are usually undertaken only by larger, more established companies with a recognized brand, as in the following example.

EXAMPLE 6

In early 2018, Sweden-based music streaming company Spotify Technology SA became the first foreign issuer to go public via direct listing on the New York Stock Exchange (NYSE). Founded in 2006, Spotify secured multiple rounds of venture capital equity financing and also raised debt prior to going public. Unlike other private companies seeking to go public, Spotify was a well-known brand and an established company, having entered the US market in 2011, with over 70 million global subscribers and over \$5 billion in revenue during the prior

year. When announcing its direct listing, Spotify said it chose this financing route because it could list without diluting existing shareholders, offer liquidity to existing shareholders, and provide equal access to buyers and sellers.

Alternatively, a private company may become public via an acquisition. This may occur indirectly if the company is acquired by another that is already public. In such cases, the acquiring company is usually larger, so an investor in the combined entity has minimal exposure to the private company that was acquired.

Another means of going public via acquisition is through a **special purpose acquisition company (SPAC)**, which is a transaction like the reverse merger that was popular in the 1990s and early 2000s. A SPAC is a shell company, often called a “blank check” company, that exists solely for the purpose of acquiring an unspecified private company sometime in the future. SPACs raise capital and go public through an IPO. Proceeds are placed in a trust account and can be disbursed only to complete an acquisition; otherwise, they must be returned to investors. SPACs are publicly listed, often specialize in a particular industry, and have a finite time period, such as 18 months, to acquire a private company before proceeds are returned to investors. While investors in a SPAC may not know which private company the SPAC will buy, they may have expectations based on the SPAC executives involved or comments these individuals have made in the media.

Once the SPAC completes the purchase of a private company, that company becomes public. SPACs are replacing the formerly used reverse merger process of going public, which typically used a dormant listed company with a previous business and trading history.

KNOWLEDGE CHECK



1. Match the method by which a private company can go public with the most closely related term.

Going Public Method:

IPO	“blank check,” existing shareholder, underwriter
Direct listing	“blank check,” existing shareholder, underwriter
SPAC	“blank check,” existing shareholder, underwriter

Solution:

IPO	underwriter
Direct listing	existing shareholder
SPAC	“blank check”

An IPO is facilitated by investment banks that underwrite, or guarantee, the offering. A direct listing does not involve an underwriter, and no new capital is raised. Instead, the company is simply listed on an exchange, and shares are sold by existing shareholders. A SPAC is a shell company often called a “blank check” company because it exists solely for the purpose of acquiring an unspecified private company sometime in the future.

2. True or false: Accredited investors are the capital providers qualified by regulators to invest in public companies. Justify your answer.

Solution:

The statement is false. Accredited investors are judged by regulators to have the sophistication for understanding and assuming the risks that come with investing in *private*, not public, companies.

Going from Public to Private

Public companies may also decide to go private. A “take-private” or “go-private” process involves investors acquiring all of the company’s publicly traded shares and delisting the company from the exchange. The investors must typically pay a premium above the current share price and often use debt to finance the acquisition. Go-private transactions are initiated by investors who believe that actions could be taken that would result in a higher valuation than that reflected in the current share price. Going private puts these investors in control and takes the company out of public view, which may be beneficial. These actions undertaken with greater private control might include management changes, selling assets, restructuring, or realizing cost savings that are expected to exceed the premium paid and financing costs. Once these actions are complete, investors may take the company public again several years later if they are able to achieve the desired valuation at that time.

Public versus private company trends can provide insight into market developments. For example, many emerging economies have a growing number of public companies, while the opposite is occurring in developed economies. Emerging economies are usually characterized by higher rates of growth, a transition to more open market structures, and foreign capital inflows. This is consistent with a growing number of listed companies on an emerging economy’s domestic stock exchange.

A declining number of listed public companies in developed markets is a result of several factors. One cause is a higher number of mergers and acquisitions, which reduces the number of independent listed companies. Another is the growing number of private capital sources available, such as venture capital and private equity, allowing companies to access needed capital while avoiding the additional cost, regulatory burden, public scrutiny, and compliance costs associated with a public listing. Another factor is that many private companies simply choose to remain private because it preserves control by incumbent owners and management.

The Varieties of Corporate Owners

Corporations offer a great deal of flexibility in ownership and objectives. As discussed earlier, shareholders include not only individual and institutional investors but also other corporations, governments, and non-profits, which may be controlling owners.

Governments sometimes create legally separate corporations while maintaining 100% or varying levels of ownership. For example, a sovereign government may establish a wholly owned corporation but create a board of directors and management structure, along with compliance and reporting requirements, such as the issuance of audited financial statements. This structure provides increased transparency to taxpayers and external investors (limited to debt investors in this case) as to whether the corporation achieves its objectives and generates a profit or a loss, which must be financed from the government’s budget. This structure is used by the United States

Postal Service (USPS), while postal services in some countries, such as the Netherlands (KPN), the United Kingdom (Royal Mail), and Germany (Deutsche Post), are partly or fully investor owned.

Government-owned corporations exist in both developed and emerging economies, in some cases to supply public goods, such as infrastructure, which creates positive externalities, and in others to earn profits in a major domestic industry. For example, government-owned corporations are common in developed economies among postal systems, railways, and other infrastructure, such as airports. In emerging economies, state-owned or state-controlled enterprises often operate in a dominant domestic industry, such as basic commodities or energy. Financial intermediaries, such as banks, are also often first established as government institutions in these markets. As the economy seeks foreign and domestic capital from the private sector to expand and diversify, government companies are often gradually transferred to private sector ownership via an IPO, as in the following example.

EXAMPLE 7

Saudi Aramco IPO

Nearly 50 years after oil was first discovered in Saudi Arabia, the government issued a decree creating the Saudi Arabian Oil Company (Saudi Aramco) to take control of and carry out petroleum and natural gas production in the country. To partially finance a plan to diversify the Saudi economy and reduce reliance on oil, the Saudi government announced its intention in 2016 to raise up to \$100 billion on global exchanges by selling a 5% stake in the company, valuing Saudi Aramco at \$2 trillion. Given IPO delays and a lower, \$1.7 trillion valuation, in 2019, the Saudi government opted to scale down its plans, selling a 1.5% stake on the domestic Saudi stock exchange for \$25.6 billion instead. Despite the smaller size, this transaction was the largest IPO to date and created the world's most valuable publicly traded corporation at the time.

In other instances, industry deregulation and/or technological change is the catalyst for a shift from government to private sector ownership. For example, the telecommunications industry shifted from government-owned monopolies across developed and less developed economies in the 1980s to many private sector corporations and varying degrees of government ownership today. This expanded access to capital has greatly enhanced the industry's ability to invest in rapidly evolving cellular technology. In the area of power generation, a similar shift from government to private sector has occurred, leading to greater diversification of energy production, as well as recently leading to investment in sustainable and renewable sources of energy, as in the case of Public Power Corporation S.A.

EXAMPLE 8

Public Power Corporation S.A.

The largest electric power company in Greece, Public Power Corporation (PPC), was established as a state-owned and -managed corporation by the Greek government in 1950. Following Greece's entry into the EU, PPC lost its domestic power generation monopoly. In response to the European Electricity Directive separating power generation, transmission, and distribution, the company issued an IPO in 2001 for 34% of its shares and reduced government ownership further, to 51%, through subsequent share raises over the next few years. The company

is phasing out coal-fired power plants and shifting to renewable energy sources, and in 2021, it announced a further share capital increase of EUR750 million combined with a reduction in government ownership, from 51% to 34%.

Corporate shareholders also commonly include non-profits, such as foundations and endowments, some of which have grown to significant size. In addition to financial objectives, non-profits typically have societal and other non-financial responsibilities to their beneficiaries, as in the following example.

EXAMPLE 9

Novo Nordisk Foundation and Novo Nordisk A/S

The Denmark-based Novo Nordisk Foundation is the largest private foundation in the world. It has a dual objective: to provide a stable basis for the commercial and research activities conducted by investee companies within and to support scientific and humanitarian purposes. Through its holding company, Novo Holdings A/S, the foundation is the largest and controlling shareholder of the for-profit, listed Danish biopharmaceutical company Novo Nordisk A/S.

QUESTION SET



1. A corporate issuer has the following attributes: It has no need for new equity financing, its debt needs are well satisfied through its existing credit facility with a bank, and it has a majority owner that exercises management control of the company. Is this corporate issuer more likely public or private?

- A. Public
- B. Private



Solution:

B is correct. The lack of need for new equity capital implies less reason to have exchange-listed stock, as does the ability to operate the business with the current debt capacity available under its existing credit facility. The majority owner exercising management control could possibly imply either public or private status, although combined with the first two attributes, it is doubtful that such a company would be public.

2. Which of the following does *not* reflect a primary difference between an initial public offering (IPO) and a direct listing?

- A. Whether or not employees own shares in the private company
- B. Whether or not new capital is raised
- C. Whether or not an underwriter is used

Solution:

A is correct. A company with employee shareholders can go public with either an IPO or a direct listing; employee shareownership does not differ by the choice of transaction.

C is incorrect. An IPO uses an underwriter to manage the process and underwrite the purchase of new shares, while a direct listing does not.

B is incorrect. An IPO raises new capital for the listing company by issuing new shares to the public, while a direct listing does not; it lists only existing shares.

3. Describe two benefits of being a public company and two reasons that an issuer may instead prefer to be private company.

Solution:

Benefits of public status:

- Public listing allows the company to access capital from a broader range of investors, thus making larger capital raises more feasible.
- Public listing allows for price transparency for investors and ease of trading because of stock exchange listing. This may be especially beneficial if employees own significant stock, because listing creates a market for these shares.

Benefits of private status:

- Fewer disclosure requirements, thus reducing compliance costs and perhaps conferring competitive advantages because information can be kept private.
- Fewer stakeholders, thus allowing for improved access to communication channels.

4. Identify a major reason why a national government would be a 100% shareholder in a corporate issuer, and discuss two factors that may cause a national government to reduce its ownership in a state-owned company.

Solution:

A national government may choose to be the 100% owner of a company that provides public goods to the national economy, such as infrastructure and public safety, that would either not be provided by private means or be delivered inequitably or inefficiently. In some cases, a country may have natural resources, such as crude oil, and the national government may use a wholly owned corporation for production and to invest profits in ways that benefit its country.

Two possible reasons that a country may reduce its ownership in a state-owned company include (1) opportunities to bring in foreign capital and diversify the country's economy, such as the case highlighted by the Saudi Aramco example, and (2) a push for privatization and deregulation to potentially lower costs through competition and motivate innovation, as highlighted by the postal services examples.

5. A public company acquires a private company. Is the acquired company public or private after the acquisition? Explain the rationale for your choice.

- A. Public
- B. Private

Solution:

A is correct. Even though the acquired company will not have its own shares, the shareholders of the acquirer own the formerly private company, though the percentage of assets of the combined company attributable to the acquired company may be small. The acquirer's board of directors and management now operate the newly acquired company.

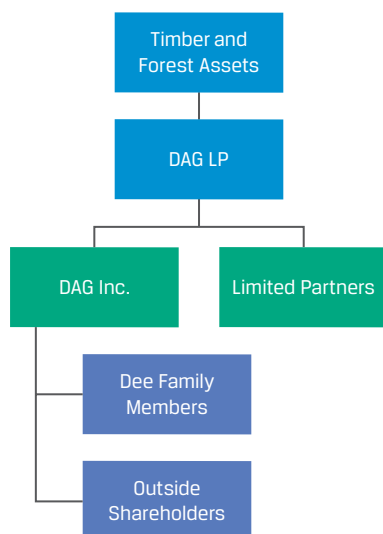
PRACTICE PROBLEMS

The following information relates to questions 1-5

Dee's Arbor Group Inc. (DAG Inc.) is a large international investor in timber and forest assets located on the North and South American continents. DAG Inc. is the general partner of DAG LP, a limited partnership that is the 100% owner of the timber and forest assets. DAG LP is controlled by DAG Inc. and its limited partners; the limited partners own a 20% stake in the partnership, while DAG Inc. holds the remaining majority stake.

DAG Inc.'s shares are listed on stock exchanges in the United States and Canada. DAG Inc. is organized as a special corporate form available in its jurisdiction in which it does not pay corporate income taxes so long as it distributes all of its net income as dividends to its shareholders and complies with other conditions. In the current and past fiscal years, DAG Inc. has complied with all of these conditions.

DAG Inc.'s shares are owned by various members of the Dee family, who hold several key senior management positions at DAG Inc. and DAG LP, and collectively they own 30% of the shares of DAG Inc. The remainder of DAG Inc.'s shares are owned by a variety of individual and institutional investors, none of whom own more than 5%. The following diagram shows the organizational structure of DAG Inc. and DAG LP.



- What percentage of the timber and forest assets are effectively owned by the Dee family members in this scenario?
 - 24%
 - 30%
 - 80%
- Which of the following best describes the taxation of DAG Inc. and DAG LP?
 - DAG LP pays tax based on its pre-tax income.

- B.** Shareholders of DAG Inc. pay tax based on dividend income.
 - C.** DAG Inc. pays tax based on its pre-tax income.
 - 3. Which of the following best describes DAG LP and DAG Inc.?
 - A.** Neither DAG LP nor DAG Inc. is managed by a majority owner.
 - B.** DAG Inc. has limits to its ability to raise new capital because of the dividend requirement on its corporate form.
 - C.** DAG Inc. faces unlimited liability as the general partner, while DAG Inc.'s status as a corporation implies that its shareholders face limited liability.
 - 4. What is a significant difference between the limited partners of DAG LP and the outside shareholders of DAG Inc.?
 - A.** Managerial responsibilities
 - B.** Taxation of income from the partnership
 - C.** The ability to vote and replace members of the DAG Inc. board of directors
 - 5. Which of the following rationales would be most consistent with the Dee family's choice to create this complex organizational structure instead of simply organizing as a limited partnership?
 - A.** It provides management control without the need for majority ownership by the family, while maintaining limited liability.
 - B.** The complex structure eliminates the potential for double taxation.
 - C.** The complex structure avoids potential problems associated with outside investors exercising voting rights.
-

SOLUTIONS

1. A is correct. The Dee family effectively owns 24% of the timber and forest assets. They own 30% of the shares of DAG (the publicly traded corporation), and they own 80% of the limited partnership (which owns the assets): $24\% = 30\% \times 80\%$.
2. B is correct. DAG Inc. is organized as a special corporate form available in its jurisdiction in which it does not pay corporate income taxes. DAG LP, as a limited partnership, is a pass-through entity. DAG Inc. shareholders pay tax on dividend income.
A is incorrect. DAG LP is a limited partnership. Partnership income is passed through to each partner, and the partners pay tax at the personal level.
C is incorrect. DAG Inc. is organized as a special corporate form available in its jurisdiction in which it does not pay corporate income taxes.
3. C is correct. DAG Inc. is the general partner of DAG LP and thus has unlimited liability in the partnership. However, as a corporation, DAG Inc.'s shareholders have limited liability for its losses and obligations.
A is incorrect. DAG LP is 80% owned by DAG Inc., the general partner that manages the partnership. DAG Inc. is 30% owned by the Dee family, who holds several key managerial positions.
B is incorrect. As a public company, DAG Inc. can raise new equity by issuing shares on an exchange. The dividend requirement is not a binding limit on its ability to raise capital but, rather, might be an attractive feature to prospective investors.
4. C is correct. The limited partners of DAG LP are not shareholders of DAG Inc., so they do not have voting rights in the corporation. Additionally, because the limited partners own only 20% of the partnership, they also have little ability to remove DAG Inc. as the general partner. In contrast, outside shareholders own 70% of DAG Inc. and have voting rights. They could use their collective ownership to effect change in the management of DAG Inc.
A is incorrect. Neither the DAG LP limited partners nor the outside shareholders of DAG Inc. have managerial responsibilities. The general partner has managerial responsibilities of the partnership, and the board of DAG Inc. has managerial responsibilities of the corporation.
B is incorrect. Owing to the special corporate form of DAG Inc., both the corporation *and* the limited partnership are pass-through entities. Therefore, neither the partnership nor the corporation pays entity-level income taxes, but both the limited partners and shareholders are responsible for personal income taxes.
5. A is correct. The Dee family can effectively control management of the timber and forest assets with only a 24% effective ownership stake in the partnership. If the family had opted for a limited partnership as the organizational form, they likely would need a much higher ownership stake to assert management control and would have unlimited personal liability.
B is incorrect. The double taxation problem is not an issue in the more complex structure, nor is it a problem in the partnership structure, because both are pass-throughs.
C is incorrect. The complex structure potentially creates problems because of the existence of outside shareholders constituting a majority of votes.

LEARNING MODULE

2

Investors and Other Stakeholders

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	compare the financial claims and motivations of lenders and shareholders
☐	describe a company's stakeholder groups and compare their interests
☐	describe environmental, social, and governance factors of corporate issuers considered by investors

INTRODUCTION

1

Corporate issuers are financed with debt and equity. Debt and equity securities have different risk and return profiles for both issuers and investors. This learning module discusses these differences and their implications, while also considering the perspectives of a broader group of stakeholders beyond debtholders and shareholders. We introduce these groups and discuss potential conflicts of interest among them. Balancing stakeholder interests is important, as both issuers and investors have increasingly incorporated environmental, social, and governance factors into their decision-making processes. Analysts assess ESG factors to better evaluate issuers' expected future performance and risk profile.

LEARNING MODULE OVERVIEW



- Corporate issuers are financed with debt and equity. Debt is a financing source with a finite length, and interest and principal payments are promised on pre-specified future dates. Debtholders have a priority claim over shareholders to an issuer's cash flows and assets.
- Equity is a source of permanent financing, and no promises of repayments or distributions to shareholders are made. Equity is a residual claim on an issuer's cash flows and assets.
- From the perspective of an issuer, debt is riskier than equity. From the perspective of an investor, equity is riskier than debt. The proportion of debt in a firm's capital structure affects both the potential return and the risk of cash flows.

- Conflicts of interest may exist between debtholders and shareholders. Debtholders' payoff is limited to promised interest and principal payments, while shareholders' payoff is theoretically unlimited as increases in firm value over the value of debt accrue to shareholders.
- Besides debt and equity investors, corporate stakeholders include the board of directors, managers, employees, customers, suppliers, governments, society in general, and the environment. The stakeholder theory of corporate governance broadens the focus of corporate decision-making beyond that of the shareholder theory.
- Environmental, social, and governance (ESG) considerations are becoming more important to both investors and analysts. ESG factors affect firms' values and can present both risks and opportunities.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

Complete each statement by selecting the most appropriate term in parentheses.

1. _____ make permanent capital available to issuers. (debtholders, shareholders)

Solution:

Shareholders make permanent capital available to issuers.

Debtholders is incorrect. Debt has a finite maturity, though it can be far in the future.

2. _____ have a residual claim against a firm's cash flows. (debtholders, shareholders)

Solution:

Shareholders have a residual claim against a firm's cash flows.

Debtholders is incorrect. Debtholders have a *priority* claim over shareholders to a firm's cash flows and assets.

3. The shareholder theory of corporate governance is _____ than the stakeholder theory. (narrower, broader)

Solution:

The shareholder theory of corporate governance is narrower than the stakeholder theory.

Stakeholders are groups and individuals with a vested interest in a firm's success and include, but are not limited to, shareholders.

4. ESG considerations are an explicit objective in the _____ theory of corporate governance. (shareholder, stakeholder)

Solution:

ESG considerations are an explicit objective in the stakeholder theory of corporate governance.

The stakeholder theory seeks to balance the interests of shareholders with the interests of a broader group that relate to ESG considerations.

5. The estimated impact of ESG factors on corporate issuers' financial and share price performance has _____ over time. (decreased, remained the same, increased)

Solution:

The estimated impact of ESG factors on corporate issuers' financial and share price performance has increased over time. This impact is the result of changing consumer and investor preferences, increased regulations and taxes related to ESG factors, and the rising threat of climate change.

6. ESG factors are increasingly recognized as _____ by analysts. (quantifiable, qualitative)

Solution:

ESG factors are increasingly recognized as quantifiable by analysts. Historically, ESG factors were considered negative externalities with no direct effect on firms' financial statements. Increasingly, analysts are quantifying the effects of ESG factors and including them in firm valuation and investment decision-making.

FINANCIAL CLAIMS OF LENDERS AND SHAREHOLDERS

2



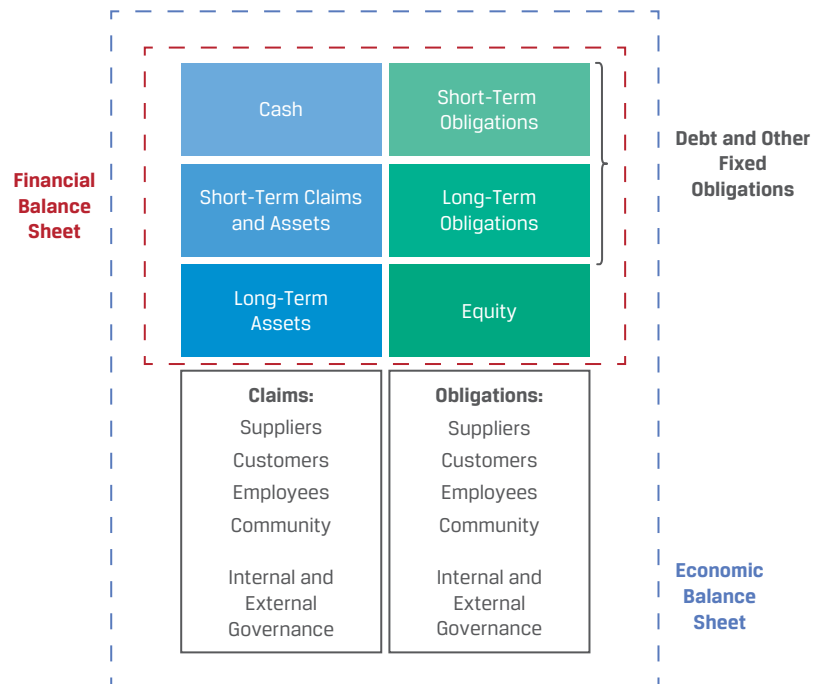
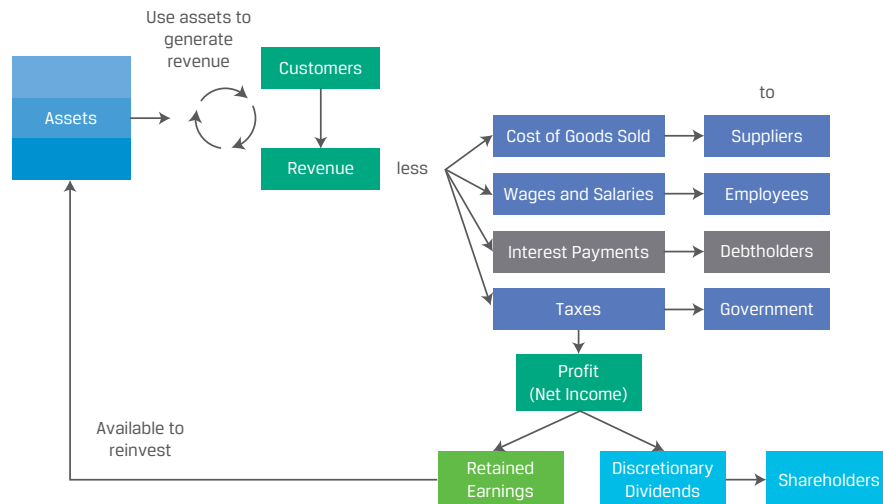
compare the financial claims and motivations of lenders and shareholders

Debt Versus Equity

The prior module established that corporations finance their assets with debt and equity. We now turn our attention to the nature of these claims, their relative risk versus return for both issuers and investors, and potential conflicts of interest that may arise between lenders and shareholders.

Debt and Equity Claims

Exhibit 1 shows the relationship between a corporation's assets and the claims of its debt and equity investors that finance them. Exhibit 2 shows that assets are used to generate income to pay interest to debtholders, while remaining profits are either reinvested or distributed to shareholders.

Exhibit 1: Balance Sheet: Assets, Debt, and Equity**Exhibit 2: Payments to Debt and Equity Investors**

Debtholders, or lenders, provide capital with a *finite* maturity. Issuers agree to make promised interest payments and to repay principal on pre-specified dates. Lenders have no decision-making power within the corporation, but debt contracts can be structured to protect lenders by imposing financial requirements and/or legal claims on certain assets of the corporation if the debt is not repaid as agreed. As shown in Exhibit 2, interest payments are paid before any distributions to equity investors and are a priority claim against a company's assets and cash flows.

Equity investors make *permanent* capital available to issuers; issuers generally do not commit to future dividends or repayments to shareholders. Rather, equity is a *residual* claim against company cash flows—whatever is left after expenses, investments, and debt payments. Cash distributions to equity investors are at the discretion of the board of directors. In contrast to lenders, equity investors have voting rights on important company matters such as choosing the board of directors, which appoints and oversees management.

In addition to interest payments to debtholders, other claims that must be satisfied before any shareholder distributions are made include payments to suppliers, employees, and governments (in the form of taxes). If a firm is dissolved and its assets are liquidated, these priority claims must be met before equity investors receive anything.

Because debt is a priority, fixed, and finite claim on assets and cash flows, it is a less costly form of financing for issuers: it is lower risk for investors than equity (though, as will be discussed, increasing debt increases risk for a company's equity investors). Another difference between debt and equity is that debtholder interest payments are usually treated as a tax-deductible expense, reducing taxable income, while dividends paid to shareholders are not.

KNOWLEDGE CHECK



1. Identify whether the attribute on the left is a feature of debt or equity.

Legal repayment obligation	Debt, Equity
Residual asset claim	Debt, Equity
Discretionary payments	Debt, Equity
Tax-deductible expense	Debt, Equity
Finite term	Debt, Equity
Voting rights	Debt, Equity

Solution:

Legal repayment obligation	Debt
Residual asset claim	Equity
Discretionary payments	Equity
Tax-deductible expense	Debt
Finite term	Debt
Voting rights	Equity

Whether offered in the form of a loan or a bond, debt involves a contractual obligation with priority interest and principal claims. Equity investors receive discretionary distributions and have a residual claim to assets. Equity dividend payments are not tax deductible. Debt requires contractual interest and principal payments, with interest expense being tax deductible for the issuer. Debt has a finite term and confers no decision-making power, while equity has an unlimited term and includes voting rights.

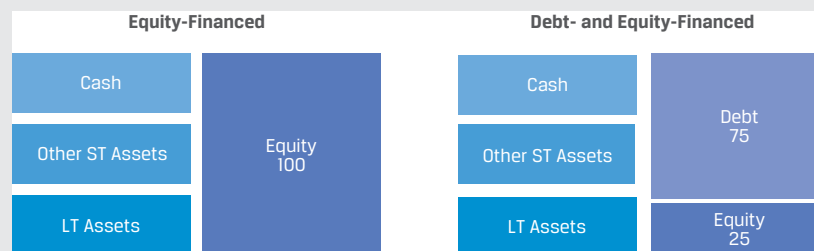
Debt Versus Equity: Risk and Return

As established earlier, debtholder claims are fixed and finite, while equity owners have ongoing claims to a firm's current and future profits. While firms usually start with equity financing, those with more predictable cash flows may choose to borrow rather than sell additional ownership stakes to finance assets. The trade-offs between debt and equity financing for both issuers and investors are best shown by the following example.

EXAMPLE 1

Equity- versus Debt-Based Balance Sheet Financing

Consider a firm with assets 100% fully financed by equity and an identical firm financed with 75% debt and 25% equity.



Assume that both firms have revenue, over a period, of 100 and operating expenses of 70. Ignore income taxes.

1. If we assume interest expense of 15 for the period, calculate net income for each firm and compare their returns on equity (ROE) for the period. Explain why ROE is higher when debt financing is used.

Solution:

Solve for net income by subtracting expenses from revenue, and divide net income by total equity to solve for the one-period return on equity:

Equity-Financed		Debt- and Equity-Financed	
Revenue	100	Revenue	100
Less: Operating Expenses	-70	Less: Operating Expenses	-70
		Less: Interest Expense	-15
Net Income	30	Net Income	15
Total Equity	100	Total Equity	25
Return on Equity	30%	Return on Equity	60%

Return on equity is higher when debt is used, because the interest cost of debt is lower than the firm's return on assets. Interest rate on debt = $15/75 = 20\%$ versus return on assets = $30/100 = 30\%$.

2. Calculate returns on equity for the period if the firms experience a 20% increase and a 20% decrease in revenue (from Question 1), assuming expenses remain unchanged.

Solution:

Solve for net income and return on equity given the increase and decrease in revenue as follows:

20% Increase in Revenue

Equity-Financed		Debt- and Equity-Financed	
Revenue	120	Revenue	120
Less: Operating Expenses	-70	Less: Operating Expenses	-70
		Less: Interest Expense	-15
Net Income	50	Net Income	35
Total Equity	100	Total Equity	25
Return on Equity	50%	Return on Equity	140%

20% Decrease in Revenue

Equity-Financed		Debt- and Equity-Financed	
Revenue	80	Revenue	80
Less: Operating Expenses	-70	Less: Operating Expenses	-70
		Less: Interest Expense	-15
Net Income	10	Net Income	(5)
Total Equity	100	Total Equity	25
Return on Equity	10%	Return on Equity	(20%)

This example demonstrates the greater potential shareholder return when debt financing is used—but also the greater risk. In particular, the net loss in the downside case for the issuer financed with debt and equity raises the possibility that it may be unable to meet future debt payments. The variation in ROE for the company financed with debt and equity is significantly higher than the ROE variation for the all-equity-financed company.

From an issuer's perspective, debt financing is less costly but involves greater risks than equity financing, because it commits the issuer not only to interest and principal payments but also to any restrictions that lenders impose in the debt contract. The greater use of debt for a given amount of equity financing, known as **financial leverage**, increases the likelihood that the firm may be unable to meet its promised obligations to lenders, resulting in bankruptcy and potential liquidation. The firm faces no such risk in the case of equity financing, as shareholders are not promised any distributions or repayments.

From an investor's perspective, stocks are riskier than bonds because shareholders hold residual rather than fixed claims against the firm. As shown in Example 1, the profits available for distribution to shareholders can vary greatly, depending on the performance of the firm as well as financial leverage. If a corporation is successful, there is theoretically no limit to how much equity owners could earn on their investment. But if the firm performs poorly, owners can lose their entire investment if the firm is liquidated and debtholders take control of the assets. Due to their limited liability, however, shareholders cannot lose more than their initial investment.

While debt financing adds risk, equity holders often prefer it to an issuer raising additional equity to fund growth, because additional share issuance reduces the fractional firm ownership of existing shareholders, known as **dilution**. The downside of dilution may be offset by an expectation that the firm will generate enough incremental profit to compensate.

EXAMPLE 2

Financing an Investment with Debt, Equity, or Cash on Hand

Consider the same equity-financed firm as in Example 1 and its choices for financing a new investment in long-term assets of 20. The pertinent details in the firm's initial balance sheet are shown below. Revenue before the investment is 100, expenses are 70 and are expected to remain unchanged, interest on new debt financing is 20%, and the return on the new investment is 30%. Ignore income taxes.

Initial Balance Sheet

Cash	30		
Other assets	20		
LT assets	50	Equity	100

1. Compare the firm's returns on equity if it finances the investment with debt, shares, or cash on hand. Discuss the results of the comparison.

Solution:

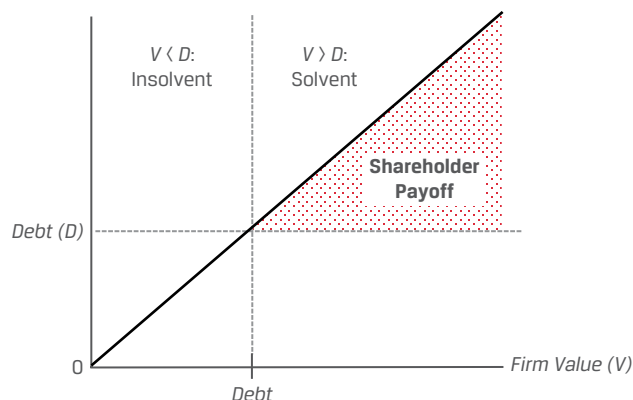
Issue Shares		Borrow		Cash on Hand	
Cash 30		Cash 30		Cash 10	
Other 20		Other 20	Debt 20	Other 20	
LT assets 70	Equity 120	LT assets 70	Equity 100	LT assets 70	Equity 100

	Issue Shares	Borrow	Cash on Hand
Revenue	106	106	106
Less: Operating Expenses	70	70	70
Less: Interest		4	
Net Income	36	32	36
Equity	120	100	100
ROE	30%	32%	36%

Financing the investment by issuing shares produces the lowest ROE due to the dilution from additional equity. Because the investment produces a return equal to the beginning ROE, there is no change in ROE. Financing with debt produces a higher ROE, because the interest rate on debt is lower than the return on the new investment and no new shares are issued, so equity does not increase. The highest ROE is produced by using cash on hand, which avoids both the increase in equity and the interest cost of new debt.

Exhibit 3 shows this shareholder payoff asymmetry over time as a function of firm value.

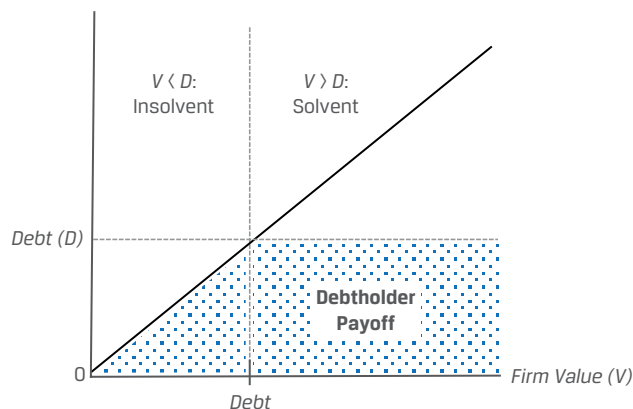
Exhibit 3: Firm Value and Shareholder Payoff



If the firm is solvent—that is, its value (V) exceeds the value of its debt (D)—then the value to shareholders is the positive difference between the firm's value and the value of its debt. Potential upside gains to shareholders are limited only by the future value of the firm. If a firm becomes insolvent, with a debt value greater than that of its assets ($V < D$), shareholders lose their entire investment and debtholders take control of the firm.

Exhibit 4 shows this asymmetry from the perspective of debtholders.

Exhibit 4: Firm Value and Debtholder Payoff



Lender returns are limited to promised interest and principal payments so long as the firm is solvent, regardless of firm performance and financial leverage. In contrast, if firm value falls below that of debt, the firm is declared insolvent and debtholders seek to recover their capital from remaining firm assets. Note that if we add the shaded areas for the shareholder payoff and the debtholder payoff, we get the diagonal line showing the total value of the firm as debtholders are owed promised payments and equity holders get the residual.

While equity owners seek to maximize firm value (to increase their payoff), bondholders seek to ensure the timely repayment of principal and interest, with the company maximizing its ability to meet its debt obligations. These perspectives are summarized in Exhibit 5.

Exhibit 5: Investor Perspectives: Equity versus Debt

Attribute	Equity	Debt
Tenor	Indefinite	Term (e.g., 3 months, 10 years)
Return potential	Unlimited	Capped
Maximum loss	Initial investment	Initial investment
Investment risk	Higher	Lower
Desired outcome	Maximize firm value	Timely repayment

KNOWLEDGE CHECK



- Corporate equity and debt holders share the same investor perspective with respect to:
 - maximum loss.
 - investment risk.
 - return potential.

Solution:

A is correct. For both equity and debt holders, their initial investment represents their maximum possible loss. The return potential is theoretically unlimited for equity holders, while it is capped for debtholders. Equity holders are exposed to a higher level of investment risk, as they hold a residual claim on the firm's cash flows that is lower in priority to the debtholders' claim.

- True or False:** Debtholders, unlike equity holders, have symmetric potential downside losses and upside gains.
 - True.
 - False.

Solution:

B is correct; the statement is false. Both debtholders and equity holders have asymmetric potential payoffs. For debtholders, potential upside gains are limited to interest and principal repayments, regardless of how high the value of the firm rises. In contrast, if the value of the firm falls below the value of its debt, debtholders can lose up to their initial investment.

For equity holders, equity value is determined as the value of the firm less the value of its debt. Potential upside gains to shareholders are limited only by the future value of the firm, while shareholder losses, like those of debtholders, are limited to their initial investment.

Conflicts of Interest among Lenders and Shareholders

While both lenders and owners are compensated from the same firm cash flows, the differing risk and return profiles of debtholders and shareholders create potential conflicts of interest.

Shareholders seek to maximize residual cash flows, or firm profits, once other obligations are met. Since these investors lose their entire investment in the case of insolvency but have unlimited upside return potential, they prefer that management pursue projects with greater calculated risks and higher potential returns while maximizing the use of debt financing. Additionally, shareholders can demand higher cash dividends, which can increase leverage, thereby increasing risk for debt investors. Example 1 illustrated the greater potential equity return associated with the use of leverage.

Bondholders seek to maximize the likelihood that they will receive timely interest and principal payments; they derive no benefit from greater leverage used to pursue projects with higher risks given limited upside. As a result, bondholders generally prefer that management invest in less risky projects that increase cash flow certainty. Since they have no voting rights over management decisions, bondholders seek to impose contractual restrictions such as requiring cash flow coverage for debt payments and/or limiting a firm's financial leverage. These restrictions prevent a firm from taking actions that may benefit shareholders but reduce the firm's likelihood of debt repayment in the future.

QUESTION SET



1. Which of the following groups has a residual claim on an issuer's cash flows?

- A. Employees
- B. Debtholders
- C. Shareholders

Solution:

C is correct. Shareholders are residual claimants to a firm's cash flows and receive discretionary distributions after priority claims (e.g., employee compensation, supplier payments, interest expenses, and taxes) are met.

2. Which is more sensitive to changes in firm value: debt or equity? Explain your answer.

Solution:

Equity is more sensitive to changes in firm value, because debtholders have fixed, priority claims while equity holders have residual claims whose value is contingent on future firm profits. On the one hand, if firm value increases, residual value accrues to shareholders while debtholder payments do not change. On the other hand, reductions in firm value fall first on equity holders. If firm value falls below debt value and the firm is declared insolvent, equity holders typically receive nothing and debtholders take control of the firm and often seek to liquidate its assets.

3. Interest payments to debtholders are:

- A. residual payments.
- B. at the discretion of the board.

C. deductible for corporate income tax purposes.

Solution:

C is correct. Interest payments on debt are tax deductible for the firm.

A is incorrect. Debtholders have priority claims on the cash flows of the firm over shareholders.

B is incorrect. Interest payments are contractual, not discretionary like shareholder dividends.

4. All of the following are characteristics of debt *except*:

A. limited liability.

B. unlimited return.

C. priority in payment.

Solution:

B is correct. Shareholders, not debtholders, have the potential for unlimited return.

A is incorrect. Debtholders and shareholders both have limited liability.

C is incorrect. Debtholders have a priority claim over shareholders to a firm's cash flows.

5. All else being equal, a jurisdiction increasing its corporate income tax rate would most likely lead to _____ (lower/higher/the same) use of debt financing by issuers.

Solution:

Higher. An increase in the corporate income tax rate would likely result in a higher mix of debt. Interest payments on debt are tax deductible, so an increase in the tax rate would reduce the after-tax cost of debt financing, all else being equal, thus making debt financing relatively more attractive than equity financing.

3

CORPORATE STAKEHOLDERS AND GOVERNANCE



describe a company's stakeholder groups and compare their interests

The prior lesson addressed the claims, relative risks and returns, and potential conflicts among debtholders and shareholders. Corporations operate in a complex ecosystem where the interested parties are a much broader group than shareholders alone. These parties depend on the company—and the company depends on them—for economic success, though their short- and long-term goals may be in conflict. A corporation's ability to maximize shareholder return and meet debt and other obligations may be either compromised or enhanced by the actions of these parties, known as **stakeholders**. A stakeholder is any individual or group with a vested interest in a company. Financial analysts must understand and incorporate these groups and their actions into their assessment of a firm's expected performance and risk profile.

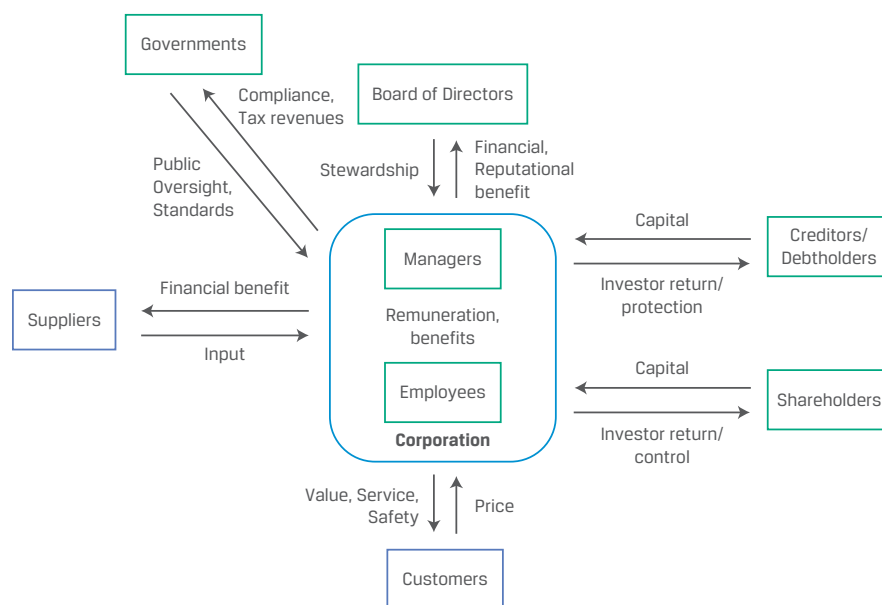
Primary stakeholder groups and their roles in a corporation include:

- debt and equity investors;
- a board of directors that supervises the corporation's activities;

- managers who execute the board's strategy and run operations;
- employees who provide human capital for the firm's operations;
- customers who demand the company's products and services;
- suppliers who provide the raw materials and goods and services not generated internally, including functions that are outsourced;
- governments that establish rules and regulations, collect taxes, and provide a variety of public goods and services; and
- other individuals and the non-human environment affected by the company's products and processes.

Exhibit 6 illustrates the primary stakeholder groups and describes their involvement with the corporation.

Exhibit 6: Key Stakeholder Groups



Shareholders versus Stakeholders

In a typical corporation, shareholders elect the board of directors, which hires managers to serve the interests of shareholders. The interests of other parties—such as creditors, employees, customers, and even society—are considered only to the extent that they affect shareholder value. This concept is referred to as the **shareholder theory of corporate governance**.

In contrast, the **stakeholder theory of corporate governance** suggests that corporate governance should consider *all* stakeholder interests, not just those of shareholders. For example, it is often suggested that environmental, social, and governance (ESG) considerations be an explicit objective of the board of directors and management. This approach gives rise to several challenges, including:

- complexity of balancing multiple objectives;
- defining, measuring, and balancing non-shareholder objectives;

- competing globally if competitors do not face similar constraints; and
- direct costs of adhering to higher ESG standards.

SHAREHOLDER VERSUS STAKEHOLDER THEORIES OF CORPORATE GOVERNANCE

The shareholder and stakeholder theories of corporate governance are not necessarily at odds with each other. In a famous 1970 essay espousing the shareholder theory, “The Social Responsibility of Business Is to Increase Its Profits,” economist Milton Friedman noted as much, particularly if management is taking a long-term perspective:

“It may well be in the long-run interest of a corporation that is a major employer in a small community to devote resources to providing amenities to that community or to improving its government. That may make it easier to attract desirable employees, it may reduce the wage bill or lessen losses from pilferage and sabotage or have other worthwhile effects. Or it may be that, given the laws about the [tax] deductibility of corporate charitable contributions, the stockholders can contribute more to charities they favor by having the corporation make the gift than by doing it themselves, since they can in that way contribute an amount that would otherwise have been paid as corporate taxes.”¹

We turn our attention next to describing a corporation’s primary stakeholder groups.

Investors

The prior lesson distinguished between shareholders’ residual claims to corporate cash flows and debtholders’ finite, fixed claims, which are senior to those of shareholders.

Shares typically entitle their owners to certain rights, including the exclusive right to vote on such important matters as the composition of the board of directors, mergers, and the liquidation of assets. While all debtholders usually establish issuer requirements and lender rights at the inception of a debt contract, **private debtholders** and public debtholders (**bondholders**) differ in several ways.

Private debtholders, such as banks and other institutions that offer loans, credit facilities, and leases, often hold a debt investment to maturity. They typically have direct access to company management and non-public information, which lowers information asymmetry. Since an individual bank or private lender can be a critical source of financing, particularly for a small or mid-sized company, they may have great influence over the company. The relaxation of debt restrictions and extension of further credit—or refusal to do so—by a single private lender can be far more impactful for companies with limited access to capital markets than for those with broad debt market access.

Private lenders may also have a wider variation in their risk appetite, approach, behavior, and relationships with borrowers. For example, a commercial real estate lessor may primarily care about receiving lease payments, the upkeep of the real estate, and whether it can renew or re-lease the asset at attractive rates. In other cases, a lender may hold *both* debt and equity in a company or take a more equity-like approach to evaluating the business. Finally, some private lenders specialize in lending to businesses as they either approach, or are in, bankruptcy.

¹ Friedman, Milton. “A Friedman Doctrine—The Social Responsibility of Business Is to Increase Its Profits,” *The New York Times*, 13 September 1970, <https://www.nytimes.com/1970/09/13/archives/a-friedman-doctrine-the-social-responsibility-of-business-is-to.html?smid=url-share>.

Bondholders, which are often institutional investors and asset managers, rely on public information such as financial statements to make investment decisions. These investors usually have little to no influence over an issuer's operations, relying instead on the terms of the debt contract negotiated at inception. While it is relatively more difficult to gain the consent of bondholders versus private lenders to change the terms of an existing agreement, bondholders can sometimes exercise significant influence if a firm in financial distress must restructure outstanding public debt.

Board of Directors

A company's board of directors is elected by shareholders to advance shareholders' interests. The board is responsible for hiring the CEO and monitoring company and management performance. Boards often include both **inside directors** (including founders and current and former managers) and **independent directors** (no material relationship with the company, including employment, family ties, and so on), who may better represent the interests of minority shareholders. Major stock exchanges maintain corporate governance standards with which listed companies must comply, and these standards often include director independence requirements. For example, the London Stock Exchange requires at least half of the directors of listed companies to be independent, and the Singapore Exchange listing rules state that "there should be a strong and independent element on the board" with a majority of non-executive directors. Besides independence, corporate governance standards also typically require boards to include a diversity of backgrounds, expertise, and competencies. Director duties are mandated by laws that vary by jurisdiction, but directors are usually required to display a high standard of prudence, care, and loyalty to the company.

While the single-tier board structure is prevalent in the USA and the UK, a two-tier corporate governance structure is common in Continental Europe and is legally mandated in some countries (e.g., Germany). Under the two-tier model, a separate **supervisory board** is elected to oversee the activities of the board of directors. The supervisory board consists solely of independent directors from among corporate stakeholders, including shareholders, employees, labor unions, the public at large, and, in some cases, government representatives for firms with state ownership. While the board of directors remains responsible for strategy and management oversight in the two-tier system, the supervisory board may appoint or dismiss board members and must approve selected board decisions, among other duties.

Although most boards hold simultaneous elections for specific terms (e.g., all board members elected annually or bi-annually), some companies have **staggered boards**, with directors divided into groups elected separately in consecutive years. It takes several years to replace a full staggered board, which limits the ability of shareholders to effect a major change of control at the company. However, staggered board elections allow for continuity without constant reassessment of strategy and oversight by new board members, which may introduce short-termism into company strategy. Staggered boards are common in Australia and several European countries.

Managers

Led by the chief executive officer (CEO), managers are responsible for determining and implementing the strategy of the corporation, under the oversight of the board of directors, as well as day-to-day operations. Senior executives and other high-level managers are usually compensated via a base salary in cash and an annual bonus that often involves cash and stock, as well as a multi-year, stock-based incentive plan and other benefits. In addition to preventing manager attrition, compensation structures are designed to align manager interests with those of shareholders and other stakeholders.

Employees

A corporation relies on the labor and skills, or **human capital**, of its employees to provide its goods and services. In return, employees typically seek competitive compensation and benefits, development opportunities, job security, and a safe and healthy work environment. In some industries and/or countries, workers join labor unions to collectively negotiate compensation, benefits, working conditions, and other matters with management. Employees may have an equity investment in their employer through equity-based participation plans (such as profit sharing, share purchases, or stock options) beyond their financial interests as employees. For most employees, equity ownership is a minor component of total compensation but can be significant in some cases.

Customers

Customers expect a company's products or services to satisfy their needs at a reasonable price while meeting applicable quality and safety standards. Depending on the product or service and their relationship with the company, customers may seek ongoing support, product guarantees, and after-sale service. While major corporate customers may exercise significant influence over a company, the loyalty and satisfaction of retail customers are also often correlated with revenue and profit growth. The environmental or social impact of products is of growing importance to customers. For example, brand boycotts and shareholder actions in response to negative environmental and social effects, as well as product-related controversies, may adversely affect sales and profits.

Suppliers

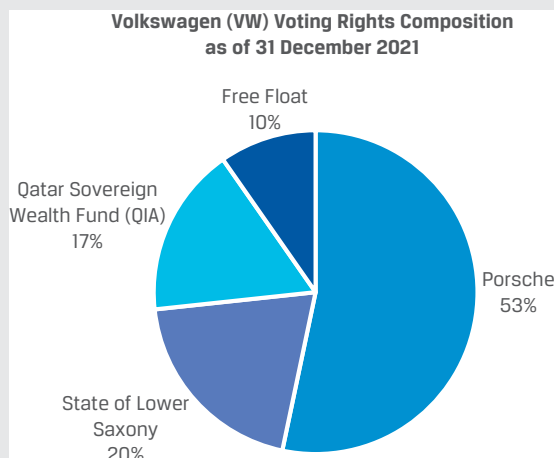
A company's suppliers include suppliers of raw materials and intermediate goods as well as software and outsourced services like call centers and payroll. Suppliers are often also short-term creditors with a primary interest in being paid in a timely manner for products or services delivered.

When a company is in financial distress, the financial position of its suppliers may be affected as well as their willingness to extend additional credit to the company. However, suppliers also have long-term interests in companies, as they seek to build and maintain mutually beneficial relationships. Supplier interest in a company's long-term stability is important when products are specialized and one or both parties have invested in the relationship through product design, training, or customization.

Governments

Governments seek to advance the interests of their constituencies and ensure the well-being of the economies over which they preside. Because corporations have a significant effect on economic output, capital flows, employment, social welfare, and the environment, among other factors, regulators have an interest in ensuring that corporations comply with applicable laws. Moreover, corporations and their employees are a major source of tax revenue.

EVOLUTION OF STAKEHOLDERS AND CORPORATE GOVERNANCE AT VOLKSWAGEN AG



Source: Volkswagen AG 2021 Annual Report

Volkswagen AG (VW) was fully government owned from 1937 until it issued public shares in 1960. The German state of Lower Saxony, where VW is the largest private employer, retained a 20% share of voting rights. A German law (the “Volkswagen law”) was enacted when VW went public, requiring *over* 80% of votes for major matters to pass, effectively giving the state veto power.

German auto rival Porsche AG (wholly owned by the Porsche family) sought to take over Volkswagen in 2007. Instead, the two companies merged in an equity deal that left the Porsche family as VW’s largest shareholder.

While the Porsche family’s majority voting rights give it power over the board of directors, the supervisory board is equally divided between labor and shareholder representatives. Given its 20% voting stake and the Volkswagen law, the government of Lower Saxony partners with labor representatives to promote the retention of local employees by vetoing domestic plant closures, cost reductions, and other measures that adversely affect union employees.

KNOWLEDGE CHECK



1. Which stakeholders would *most likely* realize the greatest benefit from a significant increase in the market value of the company?

- A. Creditors
- B. Customers
- C. Shareholders

Solution:

C is correct. Shareholders have residual claims on the company, and their wealth is directly related to the market value of the company. A is incorrect because creditors are usually not entitled to any additional cash flows (beyond interest and debt repayment) if the company’s value increases. B is incorrect because, though customers may have an interest in the company’s stability and long-term viability, they do not benefit directly from a higher company value.

QUESTION SET

1. Briefly discuss how the shareholder and stakeholder theories of corporate governance may in fact be aligned with each other.

Solution:

The stakeholder theory considers balancing the objectives of shareholders, debtholders, and the broader set of stakeholders that have a vested interest in the success of the firm. It may be in the shareholders' best interests in the long run to make decisions within this broader framework. For example, high wages and good working conditions can lead to productive employees and low employee turnover, which boosts profits.

2. Applying the stakeholder theory of corporate governance requires:

- A. balancing multiple objectives only.
- B. measuring non-shareholder objectives only.
- C. both balancing multiple objectives and measuring non-shareholder objectives.

Solution:

C is correct. To implement the stakeholder theory of corporate governance, it is necessary to both measure non-shareholder objectives and balance the objectives of shareholders and non-shareholders.

3. Identify and explain a method of aligning the interests of shareholders, managers, and employees.

Solution:

Aligning manager and employee interests with those of shareholders can be accomplished with performance- and/or share-based compensation. Shareholders seek an increase in profits and firm value, and performance-based compensation—such as bonuses based on profit or shareholder return measures, or profit sharing with employees—would align manager and employee interests with shareholder interests. Awarding shares or stock options to employees and managers increases alignment, as employees and managers become shareholders themselves.

4. Compared with public debtholders (e.g., bondholders), private debtholders (e.g., banks, lessors):

- A. have less influence over company management.
- B. have access to non-public information about the company.
- C. are less likely to consent to changes in the debt contract.

Solution:

B is correct. Private debtholders, including banks and other direct lenders, typically have direct access to management and non-public information, which lowers information asymmetry.

A is incorrect. Private debtholders typically have more influence over company management than bondholders do.

C is incorrect. Private debtholders have closer and more bespoke relationships with borrowers than bondholders do and thus are more likely to allow changes in the debt contract, such as changing covenants.

5. Which of the following board structures would most limit shareholders' ability to effect a major change in the management of a firm?

- A. Majority inside, staggered
- B. Majority independent, staggered
- C. Majority independent, non-staggered

Solution:

A is correct. A board with a majority of inside directors could more easily resist outside change than one with a majority of directors who were independent of management. Also, a staggered board would allow only a portion of the directors to be voted out each year, so it would take several years to replace a majority of directors.

CORPORATE ESG CONSIDERATIONS

4



describe environmental, social, and governance factors of corporate issuers considered by investors

Debt and equity investors are increasingly taking a *stakeholder* rather than a purely *shareholder* perspective by prioritizing environmental, social, and governance (ESG) factors in making investment decisions. Corporate issuers include these factors when setting strategic objectives as well as in their operating, investing, and financing decisions.

Exhibit 7 summarizes key ESG factors of importance to investors.

Exhibit 7: Environmental, Social, and Governance (ESG) Factors

Environmental	Social	Governance
Conservation of the natural world	Consideration of people and relationships	Standards for running a company
▪ Climate change ▪ Air and water pollution ▪ Biodiversity ▪ Deforestation ▪ Energy efficiency ▪ Waste management ▪ Water scarcity	▪ Customer satisfaction ▪ Data protection and privacy ▪ Gender and diversity ▪ Employee engagement ▪ Community relations ▪ Human rights ▪ Labor standards	▪ Board composition ▪ Audit committee structure ▪ Bribery and corruption ▪ Executive compensation ▪ Lobbying ▪ Political contributions ▪ Whistleblower schemes

Source: CFA Institute

Governance factors such as shareholder voting rights, board composition, and compensation practices are widely available and quantifiable, making it relatively straightforward for a financial analyst to evaluate the soundness of a firm's governance. Consequences of poor corporate governance have long been understood by analysts and shareholders. In contrast, incorporating *environmental* and *social* factors into

investment decision-making has evolved more slowly. While many environmental and social issues exist, identifying which of these factors are most likely to affect company performance, and how and when they will do so, is often less clear.

ESG considerations are of increasing importance for three reasons:

1. The material financial impact of ESG factors on corporate issuers has risen. Both shareholders and debtholders have suffered substantial losses due to environmental disasters, social controversies, and governance deficiencies.
2. Interest in the environmental and social impacts of investments has grown, particularly among younger clients, who increasingly demand that newly acquired or inherited wealth, as well as pension contributions, be managed with ESG considerations in mind.
3. As government stakeholders continue to prioritize climate change and social policies, revised regulations are forcing corporate issuers to adapt their business practices to meet more stringent ESG criteria.

Environmental and social issues, such as climate change, air pollution, and societal impacts of company products and services, have historically been treated as **negative externalities**, or costs not borne by the company and its investors. But increased stakeholder awareness and stronger regulations are forcing companies to internalize environmental and societal costs in their income statements, either explicitly or implicitly, for responsible investors.

While ESG factors were once regarded as intangible or qualitative information, improved identification and analysis, as well as enhanced corporate disclosures, have resulted in increasingly quantifiable information.

KNOWLEDGE CHECK



1. ESG considerations are increasingly relevant for which of the following reasons (select up to three options)?

- A. Many in the new generation of investors are demanding that investment strategies incorporate ESG factors.
- B. ESG issues are having more material impacts on companies' valuations.
- C. Environmental and social issues are being treated as negative externalities.

Solution: A and B are correct.

A is correct. A growing number among the new generation of investors increasingly demand that their inherited wealth or pension contributions be managed using investment strategies that systematically consider material ESG risks, as well as negative environmental and societal impacts, of their portfolio investments.

B is correct. ESG issues are having more material impacts on companies' valuations. Many investors have suffered substantial losses due to corporate mismanagement of ESG issues, resulting in environmental disasters, social controversies, and governance deficiencies.

C is incorrect. Environmental and social issues are less frequently treated as negative externalities than in the past. Increased stakeholder awareness and stronger regulations are forcing companies to internalize environmental and societal costs in their income statements, either explicitly or implicitly, for responsible investors.

Environmental Factors

The materiality of environmental factors can vary significantly across industries. An ESG factor is **material** when that factor is believed to have a significant impact on a company's results or business model. For firms in natural-resource-intensive industries, environmental factors often have a *direct* material effect on operations, while in other cases the impact may be material but *indirect* in nature. Environmental factors generally considered material by investors include climate change, pollution and waste, resource and land use, ecological footprint, and biodiversity.

Climate change considerations are often framed as either **physical risks** or **transition risks**. Physical risks include damage to or destruction of assets by severe weather, which is expected to significantly increase in frequency as the climate changes. Physical risks can often be insured against or diversified. Transition risks are losses related to the transition to a lower-carbon economy, which may result from regulations or shifting consumer demand. For example, a coal producer's revenues may decline materially if its electric utility customers switch to lower-emission fuel sources and renewables. A specific instance of transition risk for energy companies and their investors is **stranded assets**, or emission-intensive reserve assets at risk of becoming unviable, thereby reducing their value (e.g., even if an oil well were to produce oil from 2029 to 2059, production might have to cease early due to regulations or uneconomical prices). Analysts may find it difficult to assess this risk for energy companies, given uncertainties of regulations and break-even prices.

Adverse material environmental effects can arise from decisions based on inadequate governance or errors in judgment. For example, oil spills, industrial waste contamination, and local resource depletion can result from poor environmental standards, breaches of safety standards, or unsustainable business models. Such events can be costly in terms of regulatory fines, litigation, clean-up expenses, and reputational risk.

EMISSIONS AND WASTE AS AN ENVIRONMENTAL RISK

Environmental issues such as emissions and waste have historically been treated as externalities and have thus not been fully addressed in companies' financial reporting. However, with growing awareness among stakeholders, including regulators, companies may face financial liabilities for pollution, contamination, and the emission of toxic or carcinogenic substances and therefore must manage these risks. Gross mismanagement of these risks may result in a company not only incurring severe financial penalties but also losing permanently its license to operate.

In 2019, the collapse of Dam I of the Córrego do Feijão Mine in Brumadinho, Brazil, resulted in the spillage of millions of tons of mud; 270 lives were lost, and the nearby Paraopeba River was contaminated. The mine was owned and operated by Vale, a multi-national Brazilian mining corporation. Vale has since been accused of hiding information about the dam's instability for years to avoid damaging its reputation. Several company employees, including its ex-CEO, and its auditor, TÜV SÜD, were charged with murder and environmental crimes. Vale was fined millions of dollars by the Brazilian government and reached an agreement in 2021 to repair all environmental damage and pay USD7 billion to the families of victims killed in the disaster.

Social Factors

Social factors typically pertain to a firm's practices concerning, and their impacts on, its employees and human capital, customers, and communities in which it operates. Compensation, turnover, worker health, training and safety, employee morale, employee diversity, customer data privacy, and community relations can all affect a company's ability to sustain its performance over the long run. Minimizing social risk can lower a company's costs through higher employee productivity, lower employee turnover, reduced litigation potential, and reduced reputational risk.

DATA PRIVACY AND SECURITY AS A SOCIAL RISK

Data privacy and security addresses how companies gather, use, and secure personally identifiable information and other meta-data collected from individuals. In some industries, such as internet software and services, this issue includes managing the risks associated with government requests that may result in violations of consumers' civil and political rights.

As more services are offered online, consumers often unknowingly leave a large digital footprint using such services. Some information may be personally identifiable in nature, leaving users vulnerable to theft or misuse of data. As reported in the *2019 Cost of a Data Breach Report* released by IBM and Ponemon Institute, the average cost of a data breach is USD3.9 million.

Mismanagement of data and privacy and security breaches can have materially significant consequences for both a company's business model and its financial performance. For example, lax cybersecurity measures at Equifax, a US-based consumer credit reporting agency, led to a data breach and the theft of identity and financial data of over 140 million US citizens in 2017. Equifax has incurred hundreds of millions of dollars in expenses arising from the breach and has faced numerous lawsuits and investigations.

In a separate case, Facebook, a leading US-based social media platform, shared the personal data of over 80 million users with a third-party consultancy without users' consent. The consultancy gathered psychological profiles of users and accessed their contacts to influence voters in US elections, leading to one of the largest US government fines (USD5 billion) imposed in the technology sector to date—and to a significant decline in user trust. Facebook's subsequent renaming as Meta Platforms in late 2021 was considered by some analysts a means of distancing itself from the corporation's privacy and other social issues.

Governance Factors

As outlined in an earlier lesson, corporate governance and stakeholder management address issues that include:

- company ownership and voting structure;
- relevance of board skills and experience to current and future company needs;
- alignment of management compensation with company results;
- strength of company shareholder rights versus peers; and
- company effectiveness in managing long-term risks and sustainability.

Analyses of these areas and questions—typically found in issuers’ proxy statements, annual reports, and sustainability reports—can provide important insights about the quality of management and sources of risk. Corporate governance will be discussed in greater depth in the next learning module.

SIEMENS AG BRIBERY SCANDAL AND CORPORATE GOVERNANCE CHANGES

In 2006, German police raided the headquarters of Siemens AG, the largest industrial manufacturing firm in Europe, as officials uncovered one of the largest corporate corruption cases in history. German and US investigators subsequently discovered that the payment of bribes to foreign government officials by Siemens employees to secure sales and contracts was standard operating procedure for decades, with total bribery payments exceeding EUR1 billion (dating back to 2001). While hundreds of Siemens employees were dismissed and the firm faced over EUR3 billion in fines, the disgorgement of profits, and other costs, the failure of leadership led to substantial upheaval at the board and senior management level as well as the establishment of new governance policies.

Both the supervisory board and the managing board chairmen resigned, and for the first time in its 160-year history, Siemens hired a CEO from outside the company and most senior managers were dismissed. As the prior boards were found to lack sufficient understanding of, or engagement with, the business, both the new supervisory board and the new managing board included members with insight into operational activities and active decision-making. The new managing board was composed of the CEO, CFO, head of HR, and representatives from key operational units as well as the areas of supply chain management and sustainability, legal, and compliance. The firm increased its scrutiny and oversight of many regional businesses, whose prior autonomy had resulted in significant violations. Finally, to rebuild trust with internal and external stakeholders, Siemens instituted a firmwide anti-corruption policy designed to prevent, detect, and respond to compliance breaches.

Evaluating ESG-Related Risks and Opportunities

Recall from an earlier lesson that debt and equity investors have different claims to the same cash flows of a corporation. The process of identifying and evaluating ESG-related factors that affect these cash flows is therefore similar for both equity and corporate credit analyses.

The question of *how* and *when* ESG factors affect corporate cash flows rests on differences in their effect on the value of debt and equity claims.

- Once identified, the material effects of ESG factors must first be quantified in financial terms—that is, how are the firm’s discounted future cash flows positively or negatively affected by these factors?
- In the case of significant long-term adverse ESG-related events, equity claims are usually immediately and disproportionately affected, as they represent residual claims to future company cash flows. For example, in the Vale dam disaster, the Equifax data breach, and the Siemens bribery scandal cited earlier, all three firms experienced a sharp share price decline in the wake of the event.
- While adverse ESG-related events also affect the value of debtholder claims, these finite, fixed obligations are usually less affected than equities by such events unless the firm’s ability to make interest and principal payments is adversely affected. In the Vale, Equifax, and Siemens examples, all three

saw their respective issuer-specific cost of debt rise, and each experienced a credit rating downgrade shortly after the adverse event. Vale saw its debt rating briefly reduced to speculative grade following the dam collapse. In more extreme cases, debtholders may force a company into bankruptcy and experience significant losses in liquidation.

- In general, the effects of adverse ESG-related events often differ depending on maturity. For example, an analyst may believe a coal company has long-term risk from potential asset write-downs—that is, stranded assets due to regulatory changes or shifts in demand—which would likely have a greater negative effect on debt maturing in ten years versus short-term debt maturing in twelve months.

Analysts evaluate potential positive and/or negative effects of material ESG-related factors, whose financial impact is reflected in a company's projected financial statements and ratios—with future expected cash flows discounted at an appropriate rate and sensitivity and/or a scenario analysis used to weigh different outcomes for debt and equity holders.

For example, an analyst might increase her forecast of a hotel company's operating costs because of the impact of excessive employee turnover—lost productivity, reduced customer satisfaction, and increased expenses for employee searches, temporary workers, and training programs. As another example, an analyst might choose to lower the discount rate for a food company that is expected to gain a competitive advantage by transitioning to a sustainable source of a key ingredient in its products.

QUESTION SET



1. Historically, analysts have best been able to evaluate a company's:

- A. social practices.
- B. governance practices.
- C. environmental practices.

Solution:

B is correct. Corporate governance factors are well understood and quantifiable by analysts, including the consequences of poor corporate governance. In contrast, the inclusion of environmental and social factors in investment decision-making has evolved more slowly. The results of evaluating the effects of environmental and social factors on firm performance are often less clear.

2. Historically, environmental and social issues have been treated as _____. However, they are increasingly being recognized as _____. (negative externalities, internalized costs).

Solution:

Historically, environmental and social issues have been treated as negative externalities. However, they are increasingly being recognized as internalized costs.

It was previously assumed that the negative consequences of poor firm decisions did not fall on the firm's capital suppliers but, rather, on society. Now, analysts consider these increasingly internalized company costs by estimating their effects on firm financial performance, by incorporating them into discount rates and risk assessments, and by screening or adjusting position sizes of companies that have poor ESG practices.

3. Stranded assets best represent _____. (physical risk, transition risk)

Solution:

Stranded assets best represent transition risk.

Transition risks are losses related to the transition to a lower-carbon economy. An oil well may become a stranded asset due to government regulations or changes in consumer preferences that affect the price of oil or otherwise impair an issuer's ability to fully realize the asset value. Physical risks include damage to property stemming from extreme weather, which is expected to increase in both frequency and severity due to climate change.

4. Explain the importance of materiality of ESG factors for a financial analyst.

Solution:

An ESG factor is considered material when it has a significant impact on a company's results or business model. An analyst attempts to evaluate potential positive or negative effects of material ESG-related factors—for example, by incorporating them into a company's projected cash flows and/or discount rates or through an investment candidate screening process. While an issuer may have many ESG factors to consider, analysts prioritize those that are material given the opportunity cost of analysts' time.

5. A company's effectiveness in managing long-term risks and sustainability is best classified as a:

- A. social factor.
- B. governance factor.
- C. environmental factor.

Solution:

B is correct. Corporate governance and stakeholder management address issues that include a company's effectiveness in managing long-term risks and sustainability. Management effectiveness can be assessed through an evaluation of the company's financial and non-financial performance over the long run, along with a comparison against industry peers to isolate controllable variables.

PRACTICE PROBLEMS

The following information relates to questions 1-3

Consider a firm with assets of 200 fully financed by equity and an identical firm financed with 80% debt and 20% equity. Assume both firms have revenue over a period of 200 and non-debt operating expenses of 140.

1. If we assume an interest rate of 20% for the period, calculate net income for each firm and compare their returns on equity for the period, ignoring income taxes.
2. Calculate the return on equity for the period if the firms experience a 20% increase and decrease in revenue (from Question 1), assuming operating expenses remain unchanged.
3. Consider the same all-equity-financed firm as in Question 1 and its choices for financing a new investment in LT assets of 40. The pertinent details in the firm's initial balance sheet are shown below. Revenue before the investment is 200, operating expenses are 140 and are expected to remain unchanged, interest on new debt financing is 20%, and the return on the new investment is 30%.

Calculate the ROE for the firm if it finances the investment with debt, the issuance of new shares, or cash on hand and compare the results. Discuss the results of the comparison.

Initial Balance Sheet

Cash	60				
Other assets	40				
LT assets	100		Equity	200	
Share Issuance		Debt Issuance		Cash on Hand	
Cash 60		Cash 60		Cash 20	
Other 40		Other 40	Debt 40	Other 40	
LT assets 140	Equity 240	LT assets 140	Equity 200	LT assets 140	Equity 200
Revenue	212		212		212
Less: Operating Expenses	140		140		140
Less: Interest			8		
Net Income	72		64		72
Total Equity	240		200		200
ROE	30%		32%		36%

4. A company has developed a long-term relationship with its major supplier. The supplier has developed complex systems that integrate with those of the compa-

ny and has an agreement to receive payment within 30 days for goods delivered. Discuss the supplier's stakeholder relationship with the firm. Why would high financial leverage be inconsistent with the supplier's interests?

5. Explain why a company's management might not act in the best interests of shareholders.

SOLUTIONS

1. Solve for net income by subtracting expenses from revenue, and divide net income by total equity to solve for the one-period return on equity:

Equity-Financed		Debt- and Equity-Financed	
Revenue	200	Revenue	200
Less: Operating Expenses	-140	Less: Operating Expenses	-140
		Less: Interest Expense*	-32
Net Income	60	Net Income	28
Total Equity	200	Total Equity	40
Return on Equity	30%	Return on Equity	70%

*Interest expense with 80% debt financing = $160 \times 0.20 = 32$.

- 2.

20% Increase in Revenue

Equity-Financed		Debt- and Equity-Financed	
Revenue	240	Revenue	240
Less: Operating Expenses	-140	Less: Operating Expenses	-140
		Less: Interest Expense	-32
Net Income	100	Net Income	68
Total Equity	200	Total Equity	40
Return on Equity	50%	Return on Equity	170%

20% Decrease in Revenue

Equity-Financed		Debt- and Equity-Financed	
Revenue	160	Revenue	160
Less: Operating Expenses	-140	Less: Operating Expenses	-140
		Less: Interest Expense	-32
Net Income	20	Net Income	(12)
Total Equity	200	Total Equity	40
Return on Equity	10%	Return on Equity	(30%)

Like the example in the lesson, the use of debt increases the variance in return on equity.

3. Financing the investment with new shares produces the lowest ROE among the three financing options. However, since the investment produced a return equal

to the beginning ROE, there was no change in ROE from the initial case. Financing with debt produced a higher ROE, because the interest rate on debt was lower than the return on the new investment and no new shares were issued, avoiding dilution. The highest ROE was produced by using excess cash on hand, which avoids both dilution and the interest cost of debt.

4. The supplier has a clear vested interest in the success and survival of the company, so it is considered a stakeholder. The supplier extends short-term credit to the company and has a long-term interest in the success of the company because it has invested in integrated complex systems. High financial leverage would not be in the best interest of the supplier, because it presents both short-term risk that the company may be unable to make payments for goods delivered and long-term risk for the investment made to integrate the supplier's complex systems with those of the company.
5. Managers are in a principal-agent relationship with a company's shareholders. Managers, overseen by the board of directors, serve as agents who should act in the best interests of the company's shareholders. However, in some cases, managers may put their own interests ahead of shareholders' interests. Examples include insufficient effort, excessive perquisite consumption (e.g., corporate jets, elaborate offices), and failure to take appropriate risks or make investments in an effort to safeguard their jobs. Oversight by a majority independent board and compensation to align managers' interests with shareholders', such as performance-based and equity-based compensation schemes, are mechanisms to mitigate these conflicts of interest.

LEARNING MODULE

3

Corporate Governance: Conflicts, Mechanisms, Risks, and Benefits

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe the principal-agent relationship and conflicts that may arise between stakeholder groups
☐	describe corporate governance and mechanisms to manage stakeholder relationships and mitigate associated risks
☐	describe potential risks of poor corporate governance and stakeholder management and benefits of effective corporate governance and stakeholder management

INTRODUCTION

1

Corporations are complex structures with stakeholders beyond owners, lenders, and managers. Corporate governance involves the creation and maintenance of a system of checks, balances, and incentives that addresses conflicting interests among these stakeholders. In this Learning Module, we first identify key aspects of the relationships between these parties and the potential conflicts that may arise. In the second lesson, we turn to the various mechanisms established to manage these conflicts, settle disputes, and mitigate risk. Finally, we highlight the benefits of strong corporate governance and stakeholder management policies as well as the risks of weak policies and their potential impact on corporate performance.

LEARNING MODULE OVERVIEW



- A principal-agent relationship is created when one party (a principal) hires another party (an agent) to perform a task or service. The relationship can exist with or without a contract. The agent is expected to act in the principal's best interest.
- In many cases, the agent possesses more information than the principal, and conflicts arise where the interests of the principal and the agent diverge. In a corporation, shareholders are a principal and elect directors (an agent), who appoint managers (another agent), who are charged with maximizing shareholder value.

- Given the complex ecosystem of stakeholders in a corporation, the rights, responsibilities, and powers of each stakeholder must be considered when establishing an appropriate governance structure by striking a balance among the interests of these groups while meeting corporate objectives.
- A sound governance structure consists of mechanisms to ensure adherence to rules and regulations imposed by external authorities as well as to meet the unique requirements of internal stakeholders. These mechanisms include financial reporting, general and extraordinary meetings, compensation, debt covenants, and more.
- Weak corporate governance, unmanaged conflicts of interest, or inadequate stakeholder management can place firms at a competitive disadvantage. Strong governance practices and a proper balance among stakeholders' interests are often reflected in increased competitiveness and operational efficiency, better control processes, and improved performance.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

1. The following statements relate to the ecosystem of stakeholders in a corporation. Complete each statement by selecting one of the following: agent, principal, contractual, principal-agent, employer-employee

In a corporation, the board of directors is elected to act as a(n) _____.

In a corporation, shareholders are a(n) _____.

Customers have a(n) _____ relationship with a corporate issuer.

Solution:

In a corporation, the board of directors is elected to act as an agent.

In a corporation, shareholders are a principal.

Customers have a contractual relationship with a corporate issuer.

2. Conflicts arise where the interests of a principal and an agent diverge, resulting in agency costs. Identify and explain an example of an agency cost for a corporate issuer.<QuestionType>essay</QuestionType>

Solution:

An example of an agency cost for public companies is the cost of hiring an external independent auditor for the financial statements and internal controls. Audit fees are paid by the issuer, a cost borne by the shareholders, to mitigate the risk that financial reports are materially misstated or deviate from generally accepted accounting principles.

3. Match the mechanism to manage relationships or settle disputes with the applicable stakeholder

1. Shareholders	A. Ad hoc committee
2. Creditors	B. Proxy contest
3. Management	C. – Stock-based compensation

Solution:

1. B is correct. Proxy contests are one mechanism for shareholders to pursue changes in corporate control.
2. A is correct. When a company is struggling to meet its debt obligations, an ad hoc committee may be formed by a group of bondholders to approach the company with potential options to restructure their bonds.
3. C is correct. Stock-based compensation seeks to align the interests of management and shareholders.

4. A(n) _____ may be called when requested by a specific minimum number of calling shareholders, as detailed in the company's bylaws or charter.

Solution:

An extraordinary general meeting (EGM) may be called when requested by a specific minimum number of calling shareholders, as detailed in the company's bylaws or charter.

5. Studies have shown that improvements in corporate governance practices _____ (increase/decrease) the likelihood of a credit rating _____ (upgrade/downgrade), which tends to _____ (increase/decrease) the cost of debt.

Solution:

Studies have shown that improvements in corporate governance practices increase the likelihood of a credit rating upgrade, which tends to decrease the cost of debt.

6. What types of questions should analysts consider about a company's corporate governance and stakeholder management?<QuestionType>essay</QuestionType>

Solution:

Key questions analysts should consider about a company's corporate governance and stakeholder management include the following:

- What is the company's ownership and voting structure?
- How well do board members' skills and experience match the current and future needs of the company?
- How closely does the management team's compensation and incentive structure align with factors expected to drive overall company results?
- Who are the significant investors in the company?
- How strong are company shareholder rights versus its peers?
- How effective has management been in taking a long-term perspective on risks and sustainability?

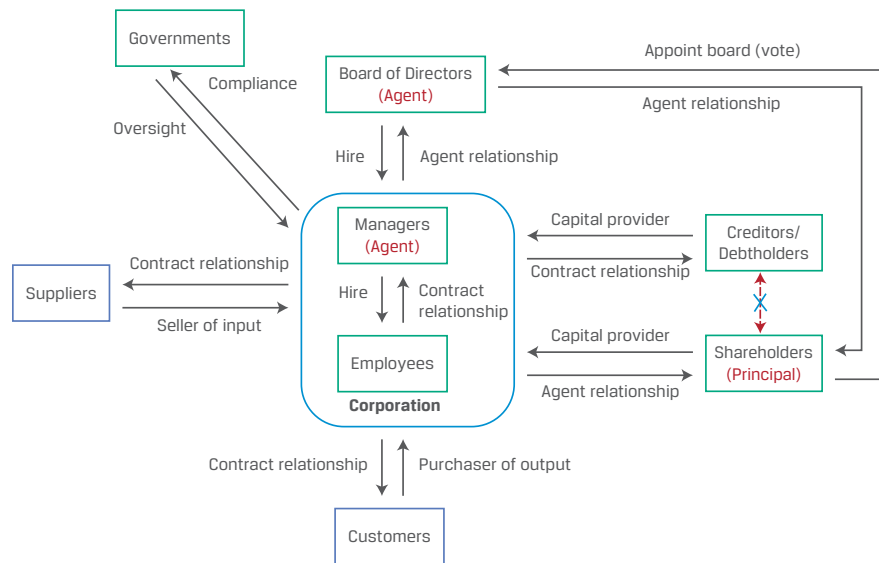
2

STAKEHOLDER CONFLICTS AND MANAGEMENT

- ☐ describe the principal-agent relationship and conflicts that may arise between stakeholder groups

A corporation is a legal entity with a complex ecosystem of stakeholders. Corporate stakeholder relationships include contractual, principal-agent, and other relationships as illustrated in Exhibit 1.

Exhibit 1: Principal-Agent and Other Relationships



A **principal-agent relationship** (or agency relationship) is created when one party (a principal) hires another party (an agent) to perform a task or service and can be present with or without a contract governing the relationship. An agent is expected to act in the principal's best interest, and the relationship involves trust and expectations of loyalty and diligence. In many cases, the agent possesses more information than the principal, which means that the principal is often unable to directly verify that the agent is acting in the principal's best interest. Conflicts arise where the interests of the principal and agent diverge, resulting in **agency costs**, which can be direct, such as the costs of hiring monitoring agents (e.g., a board of directors hiring an auditor), or indirect, like the forgone profits and economic benefits of lost opportunities.

In a corporation, shareholders are a principal and elect directors (an agent), who are expected to pursue shareholders' interests by hiring managers (another agent) to maximize shareholder value. Shareholders and lenders demand higher returns and risk premiums when faced with greater information asymmetry due to the greater potential for conflicts of interest. Principal-agent relationships and potential conflicts arise in several areas within corporations.

Shareholder, Board Director, and Manager Relationships

Directors and managers have more information about a company's performance, risks, and investment opportunities than outsiders such as shareholders and lenders. This information asymmetry lowers shareholders' ability to assess the performance of directors and managers, weakening their capacity to identify and dismiss poor performers. While all companies have some degree of asymmetric information, it is more pronounced for companies competing in many markets and geographies, those that sell complex products, and companies with lower levels of institutional ownership and free float.

In practice, compensation is the principal tool used to align the interests of management and shareholders. While management compensation seeks to motivate managers to maximize shareholder value, manager and shareholder interests may diverge in the following common ways:

- **Insufficient effort.** Managers may be unable or unwilling to make investments, manage costs appropriately, or make hard decisions like shutting down unprofitable business lines. They may conduct too little monitoring of employees or assert too little control, leading to unintentional risks and litigation. Finally, managers may allocate too little time to their role because they are committed to political or charitable activities, personal investments, or serving as directors or managers of other companies.
- **Inappropriate risk appetite.** Compensation dominated by stock grants and options can motivate excessive management risk-taking, as option holders participate only in upside share price moves. Similarly, little or no use of stock grants and options in compensation plans can lead to unduly risk-averse corporate decision-making and the inability to attract talent. This misalignment may be at odds with the company's value creation objective or shareholders' desire for higher-risk, higher-reward endeavors. Since investors can hold diversified portfolios, they may have a higher risk tolerance than managers, whose reputation and time are concentrated in a single company.
- **Empire building.** Management compensation and status are typically tied to business size (e.g., total revenues, number of employees), which can incentivize managers to seek "growth for growth's sake," such as acquisitions that do not increase shareholder value.
- **Entrenchment.** Directors and managers want to retain their jobs. Tactics to do so include copying competitors and peers, avoiding risks, and pursuing complicated transactions and restructurings that they are uniquely suited to manage. Directors may avoid speaking out against management, even if speaking out is in the interest of shareholders or other stakeholders.
- **Self-dealing.** Managers may exploit firm resources to maximize personal benefits, such as excessive perquisites (private airplanes, club memberships, personal security), or defraud investors by misappropriating assets. The smaller a manager's stake in the company, the less they bear these costs themselves, reducing their desire to maximize firm value.

KNOWLEDGE CHECK: SHAREHOLDER AND MANAGER/DIRECTOR RELATIONSHIPS

1. A construction firm has the opportunity to invest in a high-risk, high-reward capital infrastructure project. Which of the following could be a reason why the company decides not to pursue the project?
 - A. The compensation of managers is closely tied to the size of the company's business.
 - B. Management receives excessive all-cash compensation.
 - C. Management has recently received a generous options reward in the company's shares.

Solution:

B is correct. When compensation—particularly if it is excessive—is entirely in cash, the risk tolerance of managers may be too low, as they are inclined to protect their cash compensation. Additionally, there may be little upside for them if the project performs well.

A is incorrect, as it describes the “empire building” phenomenon that would likely result in the decision to grow the company at any cost in an attempt to secure higher compensation.

C is incorrect, as it would likely lead to an alignment of managers' interests with those of shareholders.

Controlling and Minority Shareholder Relationships

Corporate ownership is generally classified as dispersed or concentrated. Dispersed ownership involves many shareholders, none of whom can exercise control over the corporation. In contrast, concentrated ownership reflects an individual shareholder or a group (known as **controlling shareholders**), who can exercise control over the corporation. The group may involve a family, another company (or companies), or government.

While we have been discussing shareholders as a homogeneous group with shared interests, in fact shareholders are often a heterogeneous group with different interests, such as a founding family with a large percentage of their wealth held in company stock who thus desire management to diversify the company to achieve stability. This desire would be at odds with that of **minority shareholders** who hold diversified portfolios and would prefer that management focus on maximizing shareholder value, as they can diversify cheaply on their own. Conversely, a controlling shareholder may also be a long-term shareholder with a multi-year or multi-decade perspective, while some minority shareholders may seek quick gains from cost cutting, selling assets, or share repurchases. Shareholders can communicate with one another and form voting blocs to advocate for their interests more effectively.

Share ownership percentages alone may not necessarily reflect whether company control is dispersed or concentrated. Differences in shareholder voting schemes, as well as a **share class** with different voting rights, give rise to varying degrees of control among shareholders. In contrast to a simple structure of one vote per shareholder, a **dual-class structure** involves one share class (e.g., Class A) that carries one vote per share and is publicly held and traded and another share class (e.g., Class B) that carries several votes per share and is held exclusively by company insiders or founders. A dual-class structure allows certain stakeholders to effectively control the company even if they do not hold most of the shares outstanding. These stakeholders—who

can avoid voting-power dilution if new shares are issued—control board elections, strategic decisions, and all other significant matters. CFA Institute has long advocated against dual-class structures, because they permit one group of shareholders to have disproportionate power and potentially override the will of the majority for their own personal interest. In cases where dual-class structures are legal, CFA Institute advises issuers to clearly disclose such arrangements and their implications for investors. For more on CFA Institute’s advocacy on this and other corporate governance topics, visit www.cfainstitute.org/advocacy.

Magna International Inc., a Canadian auto parts company, started off with two classes of shares. Class A shares had one vote per share, and Class B shares had 500 votes per share. The founder, Frank Stronach, and his family were able to control 75% of the voting rights while owning only 3% of the total shares by holding Class B shares. Investors were frustrated that the founder and members of his family secured millions in consulting fees, salaries, bonuses, and stock options despite weakness in the stock price. Shareholders voted for a single-class share structure in an extraordinary general meeting, creating an agreement that Stronach would leave the company after paying out CAD870 million over five years.

KNOWLEDGE CHECK: DUAL-CLASS SHARE STRUCTURE



1. Which of the following *best* describes dual-class share structures?
 - A. Dual-class share structures can be easily changed over time.
 - B. Company founders can maintain significant power over the organization.
 - C. Conflicts of interest between management and stakeholder groups are less likely than with single-class share structures.

Solution:

B is correct. Under dual-class share systems, company founders may control board elections, strategic decisions, and other significant matters. A is incorrect, because dual-class share systems are difficult to dismantle once adopted as the voting control within dual-class systems is held exclusively by company insiders or founders. C is incorrect, because conflicts of interest between management and stakeholders are *more* likely than with single-class share structures owing to the potential control element in dual-class systems.

Shareholder versus Creditor Interests

Despite their financial claims to the same cash flows of a corporation, the difference in debt versus equity claims gives rise to potential conflicts of interest, as outlined in the previous module. For example, debtholders with a fixed claim tend to be risk averse and prefer that the corporation take actions to ensure sufficient cash flow to meet its debt obligations. For this reason, debtholders tend to prefer that a company raise more equity and limit shareholder distributions. Shareholders, however, tend to prefer greater leverage and shareholder distributions rather than dilutive equity issuance.

This potential conflict is greater for long-term debt, as the passage of time exposes debtholders to changes in business conditions, strategy, and management behavior. As a result, long-term creditors are more likely to impose contractual limits on leverage and shareholder distributions.

KNOWLEDGE CHECK: STAKEHOLDER RELATIONSHIPS

1. A controlling shareholder of Stillcreek Corporation owns 55% of Stillcreek's shares, and the remaining shares are spread among a large group of shareholders. In this situation, conflicts of interest are *most likely* to arise between:

- A. shareholders and bondholders.
- B. the controlling shareholder and managers.
- C. the controlling shareholder and minority shareholders.

Solution:

C is correct. In this ownership structure, the controlling shareholder's power is likely more influential than that of minority shareholders. Thus, the controlling shareholder may be able to exploit its position to the detriment of the interests of the remaining shareholders. A and B are incorrect, because the ownership structure in and of itself is unlikely to create material conflicts between shareholders and bondholders or shareholders and managers.

EXAMPLE 1**Leverage and Other Stakeholders: KLD Marine Ltd.**

KLD Marine Ltd. (KLD) is a small, debt-free manufacturer of welded metal boats with domestic and international sales in a highly competitive and cyclical market. KLD is the primary employer in a small, remote town. Sales are through a network of dealers, who typically sell three or four different boat brands. Of the company's 50 employees, about half are specialized aluminum welders, with most others in sales and management. The primary purchased input for KLD's boat production is sheet aluminum. KLD's sole aluminum supplier is a large, multi-national company with many clients. KLD has never paid dividends but has substantial retained earnings that finance the company's assets. KLD has recently decided to borrow heavily so it can pay a large, one-time dividend to shareholders.

1. Which of the following stakeholder groups will be most negatively affected by the increase in leverage?
- A. The welders employed by the company
 - B. The company's dealers
 - C. The supplier of aluminum to the business

Solution:

A is correct. As employees, the welders could face loss of employment if the company were to become financially distressed with the increase in leverage. And since their skills are very specialized, they would probably have difficulty finding another job locally. In a small and remote town, employment opportunities are likely to be limited for specialized workers.

B is incorrect. The dealers might suffer lost sales if KLD were to fail, but they could likely replace KLD with a competing brand.

C is incorrect. The aluminum supplier would probably suffer the least impact, since it is large and KLD is likely not a sizable proportion of its sales.

2. Is it likely that any of these groups would be affected positively?

Solution:

In all cases, impacts are negative. Note that for modest borrowing, these effects would be minor.

QUESTION SET



1. Which of the following stakeholders are *most likely* to demand higher returns and risk premiums when faced with greater information asymmetry due to the greater potential conflicts of interest?

- A. Directors and managers
- B. Suppliers and customers
- C. Shareholders and lenders

Solution:

C is correct. Greater information asymmetry increases risk for shareholders and lenders, who will seek to be compensated for taking that risk with a lower share price or multiple and a higher yield on debt investments.

A is incorrect, because directors and managers have more information about a company's performance, risks, and investment opportunities than outsiders, such as shareholders and lenders.

B is incorrect, because while suppliers and customers are outsiders with information asymmetry, their relationship is contractual and not based on investment return.

2. An analyst is examining the governance of several companies in her coverage area and learns that one of the CEOs is highly involved in political and charitable activities. These activities may result in which one of the following misalignments of interests between management and shareholders?

- A. Self-dealing
- B. Entrenchment
- C. Insufficient effort

Solution:

C is correct. The CEO's outside activities could result in insufficient effort. Managers may allocate too little time to their role because they are committed to political or charitable activities, personal investments, or serving as directors or managers of other companies.

A and B are incorrect, because while they are both examples of misalignments between management and shareholders, they are not the primary concern about management involvement in charitable and political activities, which tend to distract management rather than cause a direct conflict of interest or transaction that is not in shareholders' interests.

3. A _____ corporate ownership structure involves many shareholders, none of whom can exercise control over the corporation.

Solution:

A dispersed corporate ownership structure involves many shareholders, none of whom can exercise control over the corporation.

4. A company's management team, whose compensation includes significant stock grants and options, is pursuing a large debt-financed acquisition. The management team discusses how this acquisition may not align with the interests of all stakeholders, and it is proposed that they increase equity financing for the acquisition. Increasing equity financing for the transaction would increase support by which stakeholder?

- A. Debtholders
- B. Management
- C. Shareholders

Solution:

A is correct. Debtholders with a fixed claim tend to be risk averse and prefer that the corporation take actions to ensure sufficient cash flow to meet its debt obligations. For this reason, debtholders tend to prefer that a company raise more equity as opposed to increasing debt to a level that may increase default risk.

B and C are incorrect, because management is aligned with shareholders through stock grants and options, and shareholders tend to prefer greater leverage rather than dilutive equity issuance.

5. Discuss the potential conflicts between controlling shareholders and minority shareholders in a dual-class structure.

Solution:

A dual-class structure allows stakeholders to effectively control the company by virtue of their ownership of a share class with superior voting rights. While it is possible for minority shareholders to change voting rights in their favor, it can be difficult and expensive to do so, as illustrated by the Magna International example.

3

CORPORATE GOVERNANCE MECHANISMS



describe corporate governance and mechanisms to manage stakeholder relationships and mitigate associated risks

Given the complex ecosystem of stakeholders in a corporation, the rights, responsibilities, and powers of each must be taken into consideration when establishing an appropriate governance structure by striking a balance among the interests of these groups while meeting corporate objectives. A sound governance structure seeks to ensure that a corporation has mechanisms in place that not only facilitate adherence to rules and regulations imposed by external authorities but also meet the unique requirements of internal stakeholders.

Corporate Reporting and Transparency

Corporate reporting and transparency are foundational to governance. Without them, external stakeholders would be unaware of the company's performance and position, and thus their ability to advocate for their interests would be severely weakened. Given its importance, reporting is mandated and regulated through legal, regulatory, and quasi-regulatory means (e.g., exchange listing requirements).

Investors have access to a public company's financial and non-financial information through annual reports, proxy statements, company disclosures, investor relations resources, and other sources. This reporting includes information on a company's operations, strategic objectives, audited financial statements, governance structure, ownership structure, remuneration policies, related-party transactions, and risk factors. Most jurisdictions and stock exchanges require that listed companies' annual financial statements be audited—and interim financial statements reviewed—by third-party independent auditors.

Private companies disclose information to the public only to the extent required by regulations or voluntarily. However, they will disclose information confidentially to their investors, but the content and form of that information are subject to negotiation between stakeholders rather than standardized like the reporting by public companies. Most jurisdictions do *not* require that private companies' disclosures be audited, though private companies are free to obtain an audit, which may improve their terms with investors.

Investors rely on corporate reports and information to:

- assess company performance and that of its directors and managers;
- make valuation and investment decisions;
- vote on key corporate matters or changes; and
- ensure compliance with legal commitments in debt contracts. As it is impractical for individual bondholders to track these bond requirements, a financial intermediary known as a trustee is hired to report on and manage payment administration for bondholders.

Shareholder Mechanisms

As residual owners of the company, shareholders seek to protect their ownership claims through a variety of control mechanisms over the company. While no standard set of shareholder rights exists, global investors usually rely on common rights and mechanisms outlined in the following sections. These mechanisms are often enshrined in securities laws and enforced by regulators.

Shareholder Meetings

General meetings—or an **annual general meeting (AGM)**, typically held once a year—enable shareholders to participate in discussions and vote on matters and transactions that are not delegated to the board of directors. Common matters presented for a shareholder vote at AGMs include the following:

- Board member elections
- Appointment of independent auditor
- Approval of annual financial statements, dividends, and director and auditor compensation
- Approval of equity-based compensation plans
- “Say on pay” non-binding votes on compensation plans

Extraordinary general meetings (EGMs) may be called when other resolutions requiring shareholder approval are proposed, or when requested by a specified minimum number of calling shareholders (or proportion of stock outstanding). Matters presented for a shareholder vote at EGMs are idiosyncratic but commonly include the following:

- Special elections of board members, usually proposed by shareholders
- Amendments to bylaws or articles of association
- Mergers and acquisitions, takeovers, and asset sales
- Capital increases
- Voluntary firm liquidation

Shareholders unable to attend a meeting in person usually authorize another party to vote on their behalf in a **proxy voting** process, typically by submitting a ballot electronically or by mail. Proxy voting is the most common form of investor participation in general meetings.

KNOWLEDGE CHECK



1. Which of the following statements about extraordinary general meetings (EGMs) of shareholders is true?
 - A. The appointment of external auditors occurs during an EGM.
 - B. A corporation provides an overview of corporate performance at an EGM.
 - C. An amendment to a corporation's bylaws typically occurs during an EGM.

Solution:

C is correct. An amendment to corporate bylaws would normally take place during an EGM, which concerns significant changes to a company, such as bylaw amendments. A and B are incorrect, because the appointment of external auditors and a corporate performance overview would typically take place during the AGM.

Shareholder Activism

Shareholder activism involves investor strategies to compel a company to act in a desired manner. The primary motivation of shareholder activists is to increase shareholder value relatively quickly, although some activism involves social, political, or environmental considerations. Shareholder activists often pressure management to act using tactics such as initiating proxy fights, proposing shareholder resolutions, and publicizing issues of contention.

Hedge funds are among the predominant shareholder activists. Unlike most institutional investors, hedge funds base the majority of their fees on returns, granting them a significant stake in the financial success of an activist campaign. Also, hedge funds face fewer investment restrictions and are therefore able to take on large share positions using borrowed funds. Regulated investment entities such as mutual funds, however, are subject to investment restrictions (e.g., limitations on maximum position size, leverage, and ownership of distressed or illiquid securities) that limit these activities, although some large funds use their influence to encourage positive corporate action.

KNOWLEDGE CHECK

1. Which of the following *best* describes shareholder activists? Shareholder activists:
- A. help stabilize a company's strategic direction.
 - B. have little effect on the company's long-term investors.
 - C. are unlikely to alter the composition of a company's shareholder base.

Solution:

A is correct. Shareholder activists often narrow a company's strategic direction to focus on the few things that the company has historically done well, often shedding assets and closing divisions in the process.

B is incorrect, because long-term investors in a company need to consider how shareholder activists affect the company, especially if the company is restructured and management is replaced.

C is incorrect, because an activist *is* likely to change the investment thesis for a company toward restructuring, which may prompt a change in the shareholder base.

Shareholder Litigation

Shareholder activists may pursue additional tactics, such as litigation or lawsuits. One prominent type is **shareholder derivative lawsuits** (unrelated to financial derivative contracts), which are legal proceedings initiated against the board of directors, management, and/or controlling shareholders by a shareholder deemed to be acting on behalf of the company in place of its directors and officers, who have failed to adequately act for the benefit of the company. In many countries, laws restrict shareholders from pursuing legal action by either imposing minimum shareholder interest thresholds for such lawsuits or prohibiting them altogether.

Corporate Takeovers

Changes in corporate control via a takeover by shareholders or an acquirer may be pursued in several ways. One mechanism is the **proxy contest** (or proxy fight). In a proxy contest, a group seeking a controlling position on a company's board of directors attempts to persuade shareholders to vote for the group. Managerial teams can also be displaced through **tender offers** and **hostile takeovers**, which seek to take over a company through control of the board and thus management. A tender offer involves an invitation to shareholders to sell their interests directly to a group seeking to gain control. A contest for corporate control may attract arbitrageurs and takeover specialists, who facilitate transfers of control by purchasing shares from existing shareholders in the target company and later selling shares to the highest bidder. A hostile takeover is an attempt to acquire a company without the consent of the company's management.

Preservation of employment serves as an incentive for board members and managers to focus on shareholder wealth maximization. The threat of removal, however, can also have negative implications for a company's corporate governance practices if the company adopts anti-takeover measures, such as staggered board elections or a shareholder rights plan (commonly known as a **poison pill**), to reduce the likelihood of an unwanted takeover. Staggered board elections can dilute shareholder voting rights by preventing shareholders from replacing the entire board at any given election. A

shareholder rights plan enables shareholders to buy additional shares at a discount if another shareholder purchases a certain percentage of the company's shares. Such plans increase takeover costs to any potential bidder.

Creditor Mechanisms

Creditors, including private lenders like banks as well as public bondholders, have several mechanisms available to protect their interests. The rights of creditors are established by laws and according to contracts executed with the company. Laws vary by jurisdiction but commonly contain provisions to protect creditors' interests and provide legal recourse.

Bond Indenture

The rights of bondholders are established through contracts executed with the company. A **bond indenture** is a legal contract that describes the structure of a bond, the obligations of the company, and the rights of the bondholders. The terms and conditions of lending agreements either require the company to perform certain actions (or meet certain requirements) or prohibit certain actions. Bondholders may also require that certain assets be pledged by an issuer to secure its promise to repay its obligations.

Creditor Committees

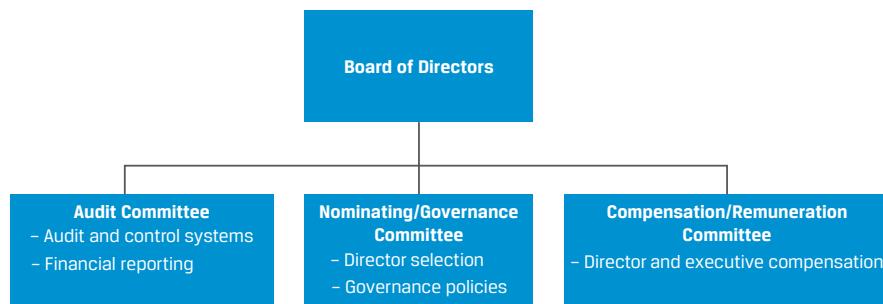
In some countries, official creditor committees, particularly for unsecured bondholders, are established once a company files for bankruptcy. Such committees are expected to represent bondholders during bankruptcy proceedings and to protect bondholder interests in restructuring or liquidation.

When a company is struggling to meet its obligations under an indenture, an **ad hoc committee** may be formed by a group of bondholders to approach the company with potential options to restructure their bonds. While members of an ad hoc committee do not officially represent all bondholders, their interests are often aligned with those of the broader bondholder group.

Board and Management Mechanisms

While the board of directors is central to a company's governance structure, boards routinely delegate specific functions to committees composed of a subset of their members. Board committees thoroughly consider, review, monitor, and follow up on matters that fall within their mandates, which may require specific expertise or independence.

Exhibit 2 outlines the three most common board committees (sometimes referred to as "core committees"), recommended by most corporate governance codes and required by some stock exchanges.

Exhibit 2: Core Board Committees and Key Oversight Functions

These committees provide recommendations and reports to the board on a regular basis. When establishing committees, boards do not delegate their ultimate responsibility nor are they discharged of their duties. The board is required to review, challenge, and assure the content of any reports raised to it by the committees and to make the proper decisions.

Audit Committee

The audit committee is the most widely required and established board committee, which, according to best practices, should be composed solely of independent board members and include at least one director with accounting or financial management expertise. The audit committee monitors the issuer's financial reporting process, including the proper selection and implementation of accounting policies according to accounting standards and regulations in order to ensure the integrity of the financial statements. It supervises the internal audit function and ensures its independence and competence. The audit committee is also responsible for recommending the appointment of an independent external auditor and proposing its remuneration. It interacts and holds meetings with the external auditor. It receives reports from the internal and external auditors, proposes remedial actions for highlighted issues or matters, and follows up on them. In some cases, the audit committee may also oversee information technology security.

Nominating/Governance Committee

The nominating, or governance, committee is also typically composed of independent members, in accordance with best practices. This committee appraises director and manager candidates and oversees the board election process. It sets nomination procedures and policies, including board directorship criteria, the search for and identification of qualified candidates for board directorships, and the election process by shareholders. In designing its policies and in nominating candidates to the board, the committee ensures that the structure of the board is balanced and in alignment with governance principles and applicable codes.

The committee also oversees the establishment and enforcement of corporate policies, including:

- a corporate governance code;
- the charter of the board and its committees;
- a code of ethics; and
- a policy on conflicts of interest, among others.

It reviews these policies periodically to incorporate any necessary changes or developments. Most importantly, it ensures implementation of governance policies, compliance with applicable laws and regulations, and the pursuit of appropriate action if any issues or violations are identified. For example, policies on conflicts of interest and related-party transactions require directors and managers to disclose any actual or potential conflict of interest related to the company, as well as any material interests in a transaction that may affect the company.

Compensation/Remuneration Committee

The compensation, or remuneration, committee develops and proposes remuneration policies for the directors and key executives, which often includes setting performance criteria and evaluating manager performance. Executive compensation attracts significant investor attention, with a focus on aligning manager and shareholder interests. The laws in most jurisdictions, as well as best practices, require all compensation committee members to be independent directors because management should not assess its own performance.

Compensation plans often include a variable component—typically profit sharing, stock, or stock options—contingent on corporate or stock price performance. However, stock-based remuneration does not serve its purpose if managers can improve their personal gains at the expense of the company while limiting their exposure to weak stock performance. As a result, companies are increasingly designing incentive plans that discourage “short-termism” or excessive risk-taking by managers. Some incentive plans include granting shares, rather than options, to managers and restricting their vesting or sale for several years or until retirement. A long-term incentive plan delays compensation, either in part or in total, until a company’s strategic objectives (typically performance targets) are met.

As a result of laws such as the Dodd-Frank Act in the USA or by choice, issuers are increasingly seeking shareholder views on executive compensation by conducting non-binding “say on pay” votes at the AGM. By allowing shareholders to express their views on remuneration-related matters, companies can limit the discretion of directors in granting excessive or inadequate remuneration.

Additional Committees

Companies can have multiple other board committees, which are often industry specific. Risk committees—common (in some jurisdictions, required) in the financial services industry—determine the risk profile and appetite of the company and ensure that the company has an enterprise risk management system in place whereby risks are identified, assessed, mitigated, and managed appropriately. Accordingly, risk committees oversee the setting of the risk policy and risk management annual plans and monitor their implementation. Insurance companies often have investment committees that ensure the company has adopted and adheres to rational and prudent investment and capital management policies.

Employee Mechanisms

By managing employee relationships, companies seek to respect employees’ rights and avoid legal or reputational risks associated with employment matters. Employee relationship management (sometimes called human capital management) helps firms attract and retain talent and ensure that employees fulfill their responsibilities and are motivated to act in the company’s best interest.

Employee rights are primarily protected through jurisdiction-specific labor laws, which define the standards for employees’ rights and responsibilities and cover such matters as work hours, post-employment, health care and other benefit coverage, and paid leave. In most countries, employees have the right to form unions. Unions

advocate on behalf of members to influence certain matters affecting employees, such as compensation and working conditions. Although not a common practice in many parts of the world, in some countries employees are represented on the board of directors—or supervisory board—of companies meeting certain size or ownership criteria (e.g., in Germany, Austria, and Luxembourg).

At the individual level, employment contracts specify the various rights and responsibilities of the employer and employee. Some companies have an **employee stock ownership plan (ESOP)** to help retain employees and further align their interests with those of the company. As part of an ESOP, a company establishes a fund consisting of shares and/or cash, which are granted to employees based on service or performance criteria and often include vesting periods.

Customer and Supplier Mechanisms

Both customers and suppliers enter into contractual agreements with a company that specify the products and services underlying the relationship, the prices or fees and the payment terms, the rights and responsibilities of each party, the after-sale relationship, and any guarantees. Contracts also specify actions to be taken and recourse available if either party breaches the terms of the contract.

Customers, owners, and other stakeholders increasingly use social media to voice or protect their interests or to enhance their influence on corporate matters. For example, negative media attention can adversely affect the reputation or public perception of a company or its managers and directors. Through social media, these stakeholders can instantly broadcast information with little cost or effort and are thus better able to compete with company management in influencing public sentiment.

Government Mechanisms

Laws and Regulations

Governments and regulatory authorities develop laws that companies must follow and monitor companies' compliance with those laws. Such laws protect and enforce property and contract rights, in addition to protecting the rights of a specific group such as consumers or the environment. Industries whose services, products, or operations are more likely to affect the public or stakeholder interests are typically subject to greater regulation. Examples include financial services, health care, and agriculture and food, as well as industries deemed to be in the national interest (e.g., defense).

Corporate Governance Codes

Many regulatory authorities have adopted corporate governance codes that consist of guiding principles for publicly traded companies. These codes require companies to disclose their adoption of recommended corporate governance practices or explain why they have not done so, known as a “comply or explain” approach. In Japan, for example, companies with no outside directors must justify why appointing outside directors is not appropriate. Some jurisdictions do not have national corporate governance codes but do make use of national corporate laws or regulations (e.g., Chile) or stock exchange listing requirements (e.g., India) to achieve similar objectives.

The USA does not have a national corporate governance code or law but does have national securities laws (e.g., the Securities Act and the Sarbanes-Oxley Act) that are enforced by a national regulator (the Securities and Exchange Commission). US stock exchanges have listing requirements that include numerous governance provisions,

such as the requirement for majority independent boards. Additionally, most US companies are incorporated in a single state, Delaware, which does have state corporate laws that, in effect, serve the same purpose as a national corporate governance code.

QUESTION SET



1. Which of the following is typically used to represent creditors' interests?

- A. Ad hoc committee
- B. Poison pill
- C. Tender offer

Solution:

A is correct. An ad hoc committee is a group of creditors who approach an issuer in financial distress with options for debt restructuring.

B is incorrect. A poison pill is used to protect shareholders, management, and the board from takeovers that could potentially undervalue the company or are otherwise unwanted.

C is incorrect. A tender offer involves an invitation to shareholders to sell their interests directly to a group seeking to gain control.

2. A primary responsibility of a board's audit committee does not include:

- A. oversight of accounting policies.
- B. adoption of proper corporate governance.
- C. recommending remuneration for the external auditor.

Solution:

B is correct. The adoption of proper corporate governance is the responsibility of a corporation's governance committee.

A and C are incorrect, because oversight of accounting policies and recommending remuneration for the external auditor are responsibilities of the audit committee.

3. Which of the following is true of shareholder activism?

- A. Shareholder activists rarely include hedge funds.
- B. Regulators play a prominent role in shareholder activism.
- C. A primary goal of shareholder activism is to increase shareholder value.

Solution:

C is correct. Although shareholder activism may involve social and political issues, shareholder activists' primary motivation is to increase shareholder value.

A is incorrect, because hedge funds commonly serve as shareholder activists.

B is incorrect, because regulators play a prominent role in standard setting, not shareholder activism.

4. True or False: Investors receive information similar in content and form, including audited disclosures, from both private and public companies.

- A. True

B. False

Solution:

False. Private companies disclose information confidentially to their investors, but the content and form of that information are subject to negotiation rather than standardized and regulated like the reporting by public companies. Most jurisdictions do not require that private companies' disclosures be audited, though they are free to obtain an audit.

5. Explain why staggered board elections weaken corporate governance.

Solution:

Staggered board elections can dilute shareholder voting rights by preventing shareholders from replacing the entire board at any given election. For example, if only 25% of the board is elected per year, it can take an activist three years to replace a majority of the board.

6. A company's compensation committee seeking to discourage excessive risk-taking by managers is *most likely* to design an incentive compensation plan that:

- A.** allows directors and managers to have greater discretion over their remuneration.
- B.** includes a variable component comprising stock options contingent on near-term stock performance.
- C.** grants shares, rather than options, that vest over several years and are subject to minimum holding requirements.

Solution:

C is correct. Granting shares, rather than options, that vest over several years and must be held discourages "short-termism" or excessive risk-taking by managers.

A is incorrect. By allowing *shareholders* to express their views on remuneration matters, companies can limit the discretion of directors and managers in granting themselves excessive (or inadequate) remuneration, thus not allowing managers to have greater discretion over their own pay.

B is incorrect, because a variable component comprising stock options contingent on near-term stock performance may encourage excessive risk-taking by managers. Stock-based remuneration does not serve its purpose if managers can improve their personal gains at the expense of the company while limiting their exposure to weak stock performance.

CORPORATE GOVERNANCE RISKS AND BENEFITS

4



describe potential risks of poor corporate governance and stakeholder management and benefits of effective corporate governance and stakeholder management

Corporate governance and stakeholder management play a critical role in the success or failure of corporations. Weak corporate governance, unmanaged conflicts of interest, and/or inadequate stakeholder management mechanisms can place firms

at a competitive disadvantage to industry peers. In contrast, strong governance practices and a proper balance among stakeholders' interests are often reflected in increased competitiveness and operational efficiency, better control processes, and improved performance. The role of corporate governance and related mechanisms in mitigating risk extends beyond operations to include legal, regulatory, reputational, and financial risks.

Operational Risks and Benefits

Corporations with weak control systems, ineffective decision-making, or inefficient monitoring often face adverse results with respect to their operations, performance, and value. In the absence of adequate controls, one stakeholder group may benefit at the expense of others. For example, when the information available to managers is superior to that received by the board or shareholders, audit procedures are poor, or oversight is lacking, managers can make decisions solely for their own benefit. The following example demonstrates the level of fraud and mismanagement that can occur when corporate governance is inadequate.

THE RISE AND FALL OF THERANOS INC.

Founded in 2003, Theranos raised over USD700 million from venture capital and private investors and was valued at USD10 billion in 2014. The company and its founder and CEO, Elizabeth Holmes, sought to revolutionize health care with breakthrough technology to inexpensively and rapidly identify numerous medical conditions using a test based on a single drop of blood. Its board featured a variety of famous and influential directors over its history, including former US Secretaries of State and directors of the US Centers for Disease Control and Prevention.

In 2015, questions began to surface publicly around the company's blood-testing technology. Whistleblowers came forward to voice concerns about questionable practices, and it became clear that the technology was flawed and that blood test results had been falsified. In 2018, the company, CEO Holmes, and COO Ramesh Balwani were charged with "massive fraud" by the US SEC and the company ceased operations, resulting in a total loss to its shareholders as well as losses to other stakeholders. Holmes was found guilty of four counts of fraud in 2022.

Subsequent investigations uncovered many corporate governance failures at Theranos related to inadequate board composition and oversight, including the following:

- While the board was composed of highly accomplished and well-known individuals, most had little to no knowledge of medical technology.
- Given its lack of medical technology expertise, the board should have hired an independent expert to validate Theranos's innovative technology, which it failed to do. An expert would also have informed the board of the lack of peer-reviewed publications by Theranos, which is highly irregular in the industry.
- The board failed to raise concerns about not only the conflict of interest regarding Holmes's romantic relationship with Balwani but also his leadership role despite a lack of relevant industry experience.

- The board dismissed fraud allegations raised by whistleblowers and remained silent even after the whistleblowers were fired soon after making their allegations.
- Finally, Theranos operated without filling key management roles such as CFO and global compliance officer, among others.

Strong governance practices involve proper scrutiny and control at all corporate levels. These mechanisms allow for the mitigation of risk factors such as fraud, or at least their identification and control at early stages. Controls are enhanced when overseen by an effective independent audit committee. By having procedures for monitoring compliance with internal and external policies and regulations and for reporting any violations, a firm can mitigate the risks of being exposed to regulator questioning or legal proceedings and their associated costs.

In addition, formal procedures for dealing with conflicts of interest and related-party transactions ensure fair dealing and avoid hidden costs associated with preferential or unfair treatment in favor of a related party.

Effective governance also clarifies the delegation of authority and the reporting lines across a company, ensuring that employees have a clear understanding of their respective responsibilities. In addition, the governance, risk, and compliance (GRC) functions in the organization work in partnership to align interests. These arrangements improve decision-making processes and provide managers with flexibility to respond to opportunities and challenges in a constantly changing environment.

Internal auditors and other internal control mechanisms like compliance and legal departments are an equally important pillar of organizational and governance structures, as they aim to ensure that decisions and activities are properly monitored and controlled to prevent risks and misconduct. These mechanisms improve the operational efficiency of the company. Similarly, when the board defines the risk profile of the firm, sets its strategic direction, and supervises its implementation, managerial decisions and firm operations are better aligned with shareholder interests, paving the way for better operational results.

Legal, Regulatory, and Reputational Risks and Benefits

Compliance weaknesses in the implementation of regulatory requirements or the lack of proper reporting practices may expose a company to legal, regulatory, or reputational risks. In such cases, the company may be investigated by government or regulatory authorities for violation of applicable laws. A company may also be vulnerable to lawsuits filed by shareholders, employees, creditors, or other parties for breach of contractual agreements or company bylaws or for violation of stakeholders' legal rights. Improperly managed conflicts of interest or governance failures can cause reputational harm to a company, and its associated costs can be significant. Such risks are particularly acute for publicly listed companies subject to scrutiny by investors, analysts, and other market participants, as in the following example.

VOLKSWAGEN AG AND DIESELGATE

In 2014, an independent study revealed that certain Volkswagen (VW) diesel automobiles had abnormally high emissions in excess of legal limits. VW insisted for a year that the excess emissions were due to technical conditions before admitting to the US Environmental Protection Agency (EPA) in 2015 that it had deliberately manipulated emission test results using illegal software. The emissions software was installed in as many as 11 million Volkswagen and Audi vehicles worldwide, 500,000 of which were sold in the USA. Legal action was taken by governments in the USA, the EU, and elsewhere.

Whether company executives were aware of the illegal software remains unanswered. However, Volkswagen's reputation was severely damaged amid concerns about board independence, proper governance and oversight of the employees who installed the software, and the blatant violation of air quality standards in the communities where the cars were sold. While legal action continues against the company, its management, and certain employees, the impact of the scandal includes the following:

- VW's share price immediately fell by over a third in the days following the announcement of the scandal.
- VW CEO Martin Winterkorn resigned in 2015 and was criminally indicted in the USA and Germany on fraud and conspiracy charges.
- Volkswagen AG has incurred over EUR32 billion (USD37.7 billion) in vehicle recalls, fines, and legal costs.
- Ongoing shareholder lawsuits seek settlements against management and board directors totaling several billion euros in additional damages.

This example illustrates the importance of a company's reputation being based on strong governance and the ability to protect the interests of stakeholders, including customers, government authorities, and ultimately, in Volkswagen's case, shareholders. Employees, creditors, customers, and suppliers often seek to build and maintain long-term relationships with companies that have a reputation for respecting constituent and stakeholder rights. Such a reputation can enhance a company's ability to attract talent, secure capital, improve sales, and reach better terms with suppliers. In addition, ethics education and training for key stakeholders help support strong governance practices. Effective governance enables a company to mitigate risks, underlying conflicts of interest, and agency problems and to maintain stable operations.

Financial Risks and Benefits

Poor corporate governance, including weak management of creditors' interests, can affect a company's financial position and hinder its ability to honor its debt obligations. A rise in the possibility of corporate default has consequences well beyond creditors and shareholders, extending to managers, employees, and suppliers, and even society and the environment.

Governance arrangements that seek to manage creditor conflicts of interest restrict those corporate actions that would hinder the company's ability to repay its debt and thus reduce its default risk. Default risks are also mitigated by the proper functioning of audit systems, the transparency and better reporting of earnings, and the control of information asymmetries between the company and its capital providers. Lower default risks are associated with a lower cost of debt, as creditors typically require a lower return when their funds are better secured and their rights are protected.

Governance practices at shareholder meetings, as well as internal corporate mechanisms such as the board of directors and its committees, give investors greater assurance that their capital is well managed. These mechanisms help assure investors that their rights to participate in discussions, vote on important matters, and enjoy fair and equal treatment are protected. Investor confidence and the company's credibility in the marketplace are also enhanced by the appropriate and timely disclosure of material information concerning operating, financial, and governance activities. The improved transparency, the integrity of financial reporting processes, and an independent audit promote the trust of shareholders and market participants in both the quality of the firm's reported earnings and the fair representation of its financial position. These

controls reduce investors' risk perception of well-governed firms and, therefore, the return required on capital invested in such firms. Consequently, good governance enhances the attractiveness of firms to investors, improves their valuations and stock performance, and reduces their cost of equity.¹ Studies have shown the following:

- Improved corporate governance practices increase the likelihood of a credit rating upgrade from speculative to investment grade, reducing the cost of debt.²
- Listed companies with experienced audit committees possessing financial expertise tend to have stronger market performance during a crisis.³
- Board diversity and independence appear to be key factors in firm valuation.⁴

Key questions analysts should consider about a company's corporate governance and stakeholder management include the following:

- What is the company's ownership and voting structure?
- Do board members' skills and experience match the current and future needs of the company?
- How closely does the management team's compensation and incentive structure align with factors expected to drive overall company results?
- Who are the significant investors in the company?
- How strong are company shareholder rights versus its peers?
- How effective is the company in managing long-term risks and sustainability?

An analysis of these areas and questions—for which a company's proxy statements, annual reports, and sustainability reports are a good starting point—can provide important insights about the quality of management and sources of potential risk.

QUESTION SET



1. Which of the following is *not* a benefit of an effective corporate governance structure?

- A. Operating performance can be improved.
- B. A corporation's cost of debt can be reduced.
- C. Corporate decisions and activities require less control.

Solution:

C is correct. A benefit of an effective corporate governance structure is to enable adequate scrutiny and control over operations.

A is incorrect, because improved operating efficiency may indeed be a benefit of an effective corporate governance structure.

1 Paul A. Gompers, Joy L. Ishii, and Andrew Metrick, "Corporate Governance and Equity Prices," *Quarterly Journal of Economics* 118, no. 1 (February 2003): 107–55; available at SSRN: <https://ssrn.com/abstract=278920> or <http://dx.doi.org/10.2139/ssrn.278920>.

2 Sanjeev Bhojraj and Partha Sengupta, "Effect of Corporate Governance on Bond Ratings and Yields: The Role of Institutional Investors and Outside Directors," *Journal of Business* 76, no. 3 (2003): 455–75; available at JSTOR: <https://doi.org/10.1086/344114> (accessed 28 May 2022).

3 H. Aldamen, K. Duncan, S. Kelly, R. McNamara, and S. Nagel, "Audit Committee Characteristics and Firm Performance during the Global Financial Crisis," *Accounting & Finance* 52, no. 4 (December 2012): 971–1000.

4 D. A. Carter, B. J. Simkins, and W. G. Simpson, "Corporate Governance, Board Diversity, and Firm Value," *Financial Review* 38, no. 1 (February 2003): 33–53; available at <https://doi.org/10.1111/1540-6288.00034>.

B is incorrect, because an effective governance structure can reduce investors' perceived credit risk of a corporation, thus potentially lowering the corporation's cost of debt.

2. An investment analyst would likely be *most* concerned about an executive compensation plan that:
- A. varies each year.
 - B. is consistent with the compensation plans of a company's competitors.
 - C. is cash-based only, without an equity component.

Solution:

C is correct. If an executive remuneration plan offers cash only, the interests of management and investors (and other stakeholders) may be misaligned. An equity-based compensation plan is commonly used to align management interests with those of shareholders.

A is incorrect, because a plan that varies over time would typically be of less concern to an analyst compared with one that did not change.

B is incorrect, because an analyst would likely be concerned if a company's executives were under- or overcompensated relative to competitors.

3. Benefits of effective corporate governance include all of the following *except*:
- A. avoidance of fraud.
 - B. higher investor confidence.
 - C. reduced cost of equity.

Solution:

A is correct. Effective corporate governance allows for the mitigation, not the avoidance, of risk factors such as fraud, or at least their identification and control at early stages.

B and C are incorrect, as these are both benefits of effective corporate governance.

4. Your colleague suggests that governance and controls are bureaucratic and slow down decision-making and value creation at companies. Discuss.

Solution:

Strong governance practices and a proper balance among stakeholders' interests are often reflected in increased competitiveness and operational efficiency, better control processes, and improved performance. Studies have shown that listed companies with experienced audit committees possessing financial expertise tend to have stronger market performance during a crisis, and board independence and diversity appear to be key factors in firm valuation—particularly for initial public offerings—and play an important role in value creation and value protection for firms.

However, governance and controls can be ineffective and slow down decision-making when the board is too big, there are too many managerial layers, managers lack relevant experience for their role, or the controls consist of a check-the-box approach that fails to produce relevant and actionable information.

5. True or False: So long as employees are not represented by labor unions or collective bargaining agreements, management and the board can ignore employee relations.

A. True

B. False

Solution:

False. For many companies, employees (human capital) are a crucial input to success and the largest category of cost. Employee relations are important whether or not employees are represented by labor unions or collective bargaining agreements, as the quality of their work directly affects customer experience and product or service quality. Employee attrition, productivity losses, the need for repeat training, and poor practices discussed in the press or social media are costly and could result in regulatory action. Companies that build and maintain positive, long-term relationships with employees can develop a competitive advantage.

PRACTICE PROBLEMS

The following information relates to questions 1-5

Kobe Steel Ltd. is a major Japanese steel manufacturer formed in 1905 that supplies global manufacturers of cars, planes, and trains. The company issued a report in March 2018 apologizing for falsifying data on the strength and durability of its aluminum, copper, steel products, and iron ore powder. Following the scandal, its stock sank to a five-year low and its cost of debt jumped to record levels.

An Independent Investigation Committee (IIC) investigated the misconduct and authored the report, which concluded that the misconduct resulted from (1) a management style that overemphasized profitability amid inadequate corporate governance, (2) the imbalanced operation of plants that resulted in reduced awareness of quality compliance among employees, and (3) insufficient quality control procedures that allowed the misconduct to take place. The report also emphasized that the company had “a culture that prioritized winning purchase orders and meeting delivery deadlines over ensuring quality.”

The company committed to implementing various measures to prevent a recurrence of the misconduct. Regarding governance, measures included the following:

- Appointing an independent chairman of the board of directors
- Having at least one-third of the board of directors be independent
- Creating a nominating and compensation committee, consisting of a majority of independent directors, to serve as a voluntary advisory body to the board of directors
- Creating an independent quality supervision committee consisting of external experts
- Creating an audit and supervisory committee consisting of five members: two internal directors and three independent directors with backgrounds in legal, financial, and industrial fields

1. Identify three key stakeholder relationships for Kobe Steel and discuss their role in the misconduct or how they were affected.
2. Discuss the stakeholder incentives and the conflicts that arose between Kobe's management and the company's customers.
3. Which of the following is considered a best practice that would strengthen the measures discussed to prevent a recurrence of the misconduct?
 - A. A shareholder rights plan
 - B. A stock-based compensation plan
 - C. An audit committee composed solely of independent board members
4. Discuss the financial risk implications of the post-scandal stock and bond prices

with regard to investor confidence.

5. Kobe Steel's governance failures *most likely* resulted in reduced:
- A. cost of debt.
 - B. agency costs.
 - C. growth opportunities.
-

SOLUTIONS

1.

Stakeholder 1	Stakeholder 2	Relationship Type	Role or Impact
Kobe Corporation	Customers (manufacturers of cars, planes, and trains)	Contractual	The company delivered an inferior-quality product that could have resulted in harm to the public.
Board of Directors	Kobe Corporation	Agent	The board failed to monitor the activities of the corporation, resulting in reputational damage, civil complaints, and legal action.
Managers	Employees	Contractual	The culture prioritized winning purchase orders and meeting delivery deadlines over ensuring quality.

2. The company supplied potentially faulty steel and other material inputs to manufacturers of cars, planes, and trains. The customers were incentivized by the advertised quality of the products, while management was incentivized by winning purchase orders and meeting delivery deadlines. A certain quality standard should have aligned interests, but instead the potential for profits created a conflict between the directors and customers.
3. C is correct. The company formed an audit and supervisory committee that included a majority of independent directors, but best practices would recommend an audit committee composed solely of independent members, with at least one director with accounting or related financial management experience.
A is incorrect. A shareholder rights plan, also known as a poison pill, is used to defend against unwanted takeovers that could potentially undervalue the company, but it does not defend the company or shareholders against management or employee misconduct.
B is incorrect. A stock-based compensation plan is used to align the interests of management with those of shareholders, though it might further incentivize risk-taking and misconduct, which is the issue in this case.
4. The stock price fell and the cost of debt increased, indicating that investor and creditor confidence in the company declined. Investors will have to assess how much the company's financial results benefited from the past misconduct and estimate the impact from (1) the company no longer falsifying data and (2) the loss of customer confidence even if the company fixes the issues. Strengthening governance to include best practices is a first step toward restoring investor confidence, but the impact on future sales and profitability is key to the stock price and cost of debt going forward.

5. C is correct. The misconduct likely caused reputational damage to Kobe among current and prospective customers, which reduces growth opportunities.
- A is incorrect, because bond yields jumped to record levels soon after the scandal was announced, suggesting a higher perceived default risk. Higher default risks are associated with a higher cost of debt, as creditors typically require a higher return when their funds are less secured and their rights less protected.
- B is incorrect, because Kobe is incurring higher agency costs in the wake of the governance failure by hiring an independent investigative committee, independent directors, and external quality assurance experts.

LEARNING MODULE

4

Working Capital and Liquidity

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	explain the cash conversion cycle and compare issuers' cash conversion cycles
☐	explain liquidity and compare issuers' liquidity levels
☐	describe issuers' objectives and compare methods for managing working capital and liquidity

INTRODUCTION

1

Earlier lessons introduced the balance sheet of corporate issuers, composed of assets financed by liabilities (including debt) and equity. This learning module covers the analysis of *short-term* assets and liabilities, those that result in cash inflows or outflows within a year. The behavior of these assets and liabilities is primarily determined by an issuer's payment and delivery terms with its customers and suppliers. Subsequent modules cover issuers' *long-term* assets, liabilities, and equity financing. Short-term assets and liabilities are a key determinant of an issuer's ability to generate cash flows for investors, and mismatches between the timing and liquidity of assets and liabilities can have catastrophic effects on a firm. For these reasons and others, analysts closely scrutinize issuers' cash conversion and liquidity.

LEARNING MODULE OVERVIEW



- Issuers invest cash to generate revenues and profits. The cash conversion cycle is the length of time from paying suppliers to collecting cash from customers.
- The cash conversion cycle is measured as the sum of days of inventory on hand and days sales outstanding, less days payable outstanding. A short cash conversion cycle means that an issuer converts an investment in inventory into cash quickly, while a long cash conversion cycle means that an issuer converts its inventory investments into cash slowly.

- Collecting cash from customers sooner, delaying payments to suppliers, and reducing inventory levels relative to sales improve an issuer's cash conversion cycle.
- Working capital is defined as an issuer's short-term assets minus its short-term liabilities. Net working capital adjusts for non-operating accounts such as cash, marketable securities, and short-term debt. The ratio of net working capital to sales is closely related to an issuer's cash conversion cycle a long cash conversion cycle is associated with higher net working capital to sales, while a short cash conversion cycle is associated with lower net working capital to sales.
- An issuer's liquidity is primarily determined by the relative amounts and liquidity of its short-term assets and liabilities, which are determined by the issuer's business model. The long-run primary source of liquidity for most issuers is cash flow from operations. Secondary sources of liquidity are typically used in crises and impose significant costs, such as issuing equity, renegotiating contracts, selling assets, and filing for bankruptcy protection.
- Drags and pulls on liquidity affect an issuer's liquidity situation. Drags on liquidity reduce cash inflows and include such issues as uncollectible receivables and obsolete inventory. Pulls on liquidity are accelerations in cash outflows or interruptions in credit.
- Issuers may adopt a conservative, moderate, or aggressive approach to working capital management, and these approaches differ in the amount of working capital held on the balance sheet as well as in their reliance on external financing and the composition of short- and long-term financing.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

1. Which of the following actions or events will most likely decrease an issuer's cash conversion cycle?

- A. Buying short-term marketable securities using cash on hand
- B. Offering customers a discount for payment received within 10 days
- C. Slowing of sales of certain goods due to changing preferences in styles

Solution:

B is correct. A prompt-payment discount would likely reduce days sales outstanding and, in turn, decrease the issuer's cash conversion cycle.

A is incorrect, because increasing marketable securities by reducing cash does not affect the issuer's cash conversion cycle.

C is incorrect, because the slowing of sales of certain goods would likely increase days of inventory on hand and, in turn, increase the issuer's cash conversion cycle.

2. Which of the following actions will most likely increase an issuer's liquidity?

- A. Forgoing a supplier's discount for prompt payments
- B. Relaxing terms for customers by lengthening the payment period

C. Purchasing short-term marketable securities with cash on hand

Solution:

A is correct. Forgoing the discount is using the supplier's financing and will result in the issuer stretching out payments on accounts payable, putting less drain on liquidity in the short run. This action increases the issuer's cash conversion cycle.

B is incorrect, because by relaxing credit terms, customers will take longer to pay, so this action increases the cash conversion cycle.

C is incorrect, because marketable securities are generally *less* liquid than cash, so this action would reduce liquidity. Even if the marketable securities are as liquid as cash (e.g., short-term Treasuries), this action would not materially affect liquidity.

3. The Plough Corporation reports the following items on its two most recent balance sheets (in millions)

	Fiscal Year-End	
	31 December 20X2	31 December 20X1
Cash	10	15
Short-term marketable securities	20	15
Accounts receivable	100	80
Inventory	200	150
Prepaid expenses	5	5
Accounts payable	100	120
Accrued expenses	50	60

Based on the cash ratio, the company has:

- A.** become less liquid.
- B.** become more liquid.
- C.** not changed regarding liquidity.

Solution:

B is correct. The cash ratios for the two fiscal year-ends are:

$$\text{Cash ratio, 20X1} = \frac{15 + 15}{120 + 60} = \frac{30}{180} = 0.1667$$

$$\text{Cash ratio, 20X2} = \frac{10 + 20}{100 + 50} = \frac{30}{150} = 0.20$$

The cash ratio has increased from 0.1667 to 0.20, indicating an increase in liquidity.

4. Which of the following events or activities is most likely to be a drag on liquidity?

- A.** Inventory that becomes obsolete
- B.** Making payments to suppliers earlier

C. Offering a discount to customers who pay within 10 days

Solution:

A is correct. As inventory becomes obsolete, it becomes more challenging to sell and inventory levels increase. This event is a drag on liquidity, because it slows cash flows.

B is incorrect, because making payments to suppliers earlier is a pull on liquidity.

C is incorrect, because offering a prompt-payment discount is likely to result in cash receipts sooner, which would improve liquidity.

5. Which of the following actions provides a secondary source of liquidity?

A. Issuance of equity securities

B. Collecting accounts receivable

C. Taking advantage of a supplier's financing and paying on the net day, day 40

Solution:

A is correct. Primary sources of liquidity include cash on hand, borrowings, and cash flow from operations. Secondary sources of liquidity generate cash at a greater cost when primary sources are insufficient, such as issuing equity.

B is incorrect, because collection of accounts receivable is a primary source of liquidity.

C is incorrect, because supplier financing is a primary source of liquidity.

6. Classify each of the following actions as either a conservative or an aggressive approach to working capital management:

	Conservative	Aggressive
Minimize inventory levels		
Greater reliance on long-term debt and equity financing		
Lower level of short-term assets		
Greater reliance on short-term debt		

Solution:

	Conservative	Aggressive
Minimize inventory levels		✓
Greater reliance on long-term debt and equity financing	✓	
Lower level of short-term assets		✓
Greater reliance on short-term debt		✓

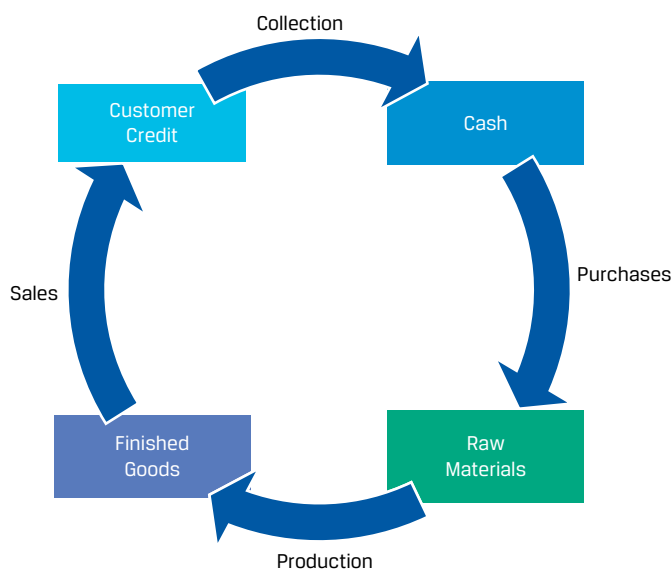
CASH CONVERSION CYCLE

2

- ☐ explain the cash conversion cycle and compare issuers' cash conversion cycles

A company's business operations are usually composed of several sequential steps. For a company that makes and sells physical goods, its operations include acquiring materials, producing inventory, selling products to customers, and collecting cash. These activities are known as the issuer's **operating cycle** and occur once or many times over a year, as illustrated in Exhibit 1.

Exhibit 1: Operating Cycle



These activities result in cash outflows and inflows that usually do *not* occur at the same time as the activity. For example, materials are purchased and received by a firm but may not be paid for in cash until weeks or months later. Goods are sold to customers, but cash may not be received until weeks or months later. Finally, inventory may take time to produce or be ready for sale, such as in the spirits industry, where an aged product like whiskey can take years before it is ready to be sold to customers.

Future cash inflows within the operating cycle are recorded as short-term assets on issuers' balance sheets, while future cash outflows within the operating cycle are recorded as short-term liabilities. Issuers' financial statements often use the terms and associated definitions in Exhibit 2 for different types of future cash inflows and outflows.

Exhibit 2: Selected Short-Term Assets and Liabilities

Short-Term Asset	Meaning
Accounts receivable	Amounts to be collected from customers for products or services sold
Inventory	Cost of products produced or purchased for sale
Short-Term Liability	Meaning
Accounts payable	Amounts owed to suppliers for products or services received

These short-term assets and liabilities are recognized based on the performance or occurrence of an activity and are derecognized when the cash inflow or outflow occurs, as illustrated in Exhibit 3.

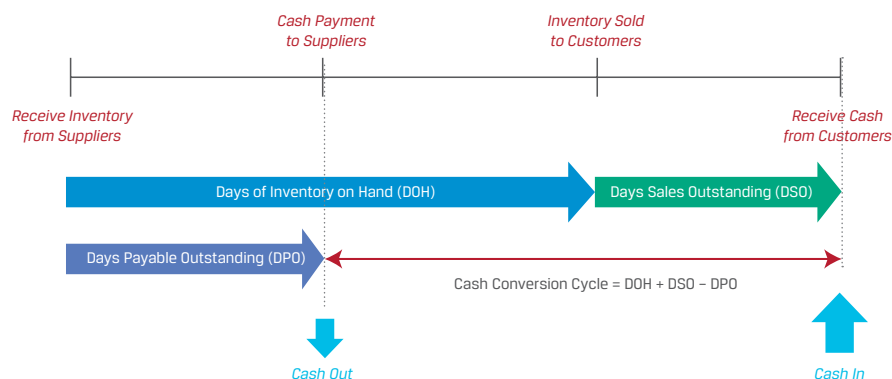
Exhibit 3: Selected Short-Term Assets and Liabilities Recognition Criteria

Short-Term Asset	Recognized When . . .	Derecognized When . . .
Accounts receivable	Product or service is sold to customer on credit	Cash is received from customer
Inventory	Issuer takes ownership of materials, goods, supplies, etc.	Product is sold to customer
Short-Term Liability	Recognized When . . .	Derecognized When . . .
Accounts payable	Product or service is received, and issuer defers payment to supplier	Cash is paid to supplier

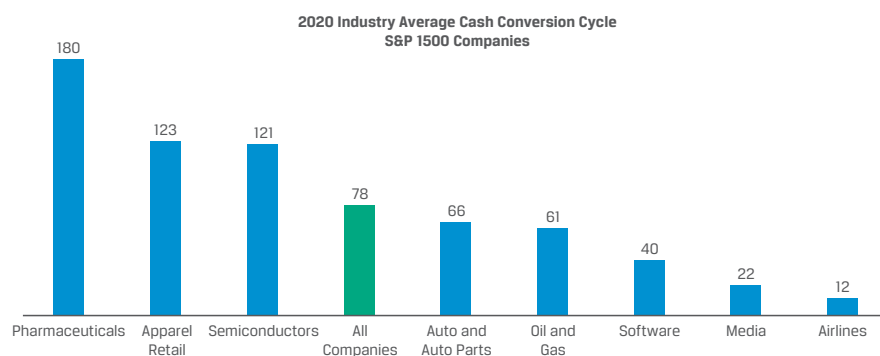
We can use the average duration of each of these short-term accounts to construct a timeline for a company's operating cycle. The amounts of time that accounts payable, inventory, and accounts receivable are outstanding on the balance sheet are known, respectively, as **days payable outstanding (DPO)**, **days of inventory on hand (DOH)**, and **days sales outstanding (DSO)**. The calculations of these amounts, known as **activity ratios**, will be discussed in detail later in the curriculum. An important quantity from this timeline for analysts is the **cash conversion cycle**: the amount of time between an issuer's paying its suppliers and receiving cash from customers (i.e., the time between derecognition of accounts payable and derecognition of accounts receivable). Formally, the cash conversion cycle, in days, is expressed in Equation 1 as:

$$\begin{aligned} &\text{Cash conversion cycle} \\ &= \text{Days of inventory on hand} + \text{Days sales outstanding} - \text{Days payable outstanding} \end{aligned} \quad (1)$$

Exhibit 4 depicts the cash conversion cycle on a timeline within the broader operating cycle.

Exhibit 4: The Cash Conversion Cycle

The cash conversion cycle is the number of days it takes a company to convert an inventory investment into cash receipts from customers. Therefore, the longer the cash conversion cycle, the longer a company needs financing to pay its bills, such as payroll, because it has not yet received cash from customers. In 2020, the average US-listed company had a cash conversion cycle of 78 days, though there was considerable variance by industry, as shown in Exhibit 5. Pharmaceutical manufacturers tend to have relatively long cash conversion cycles because they keep a considerable inventory of pharmaceuticals on hand. Airlines—a service business with minimal inventories of goods and mostly prepaid sales to customers in cash or credit cards—tend to have short cash conversion cycles.

Exhibit 5: 2020 S&P 1500 Industry Average Cash Conversion Cycles

Source: JPMorgan Working Capital Index 2021. Authors' analysis.

The ideal scenario is a short or even negative cash conversion cycle, which means that cash invested in inventory is quickly returned for subsequent investment. A negative cash conversion cycle can result from receiving cash from customers before—in some cases, *well* before—suppliers are paid. This scenario results in cash that can be used elsewhere, reducing the need for alternative financing to fund operations.

INDITEX'S NEGATIVE CASH CONVERSION CYCLE

Industria de Diseño Textil, S.A., known as Inditex, is an apparel designer, manufacturer, and retailer listed on the stock exchanges of Madrid, Barcelona, Bilbao, and Valencia. Its largest brand concept is ZARA, which specializes in fast fashion.

Inditex has a unique business model in apparel, in which it leverages its vertically integrated supply chain to design, make, and sell numerous limited runs of inventories, enabling it to keep up with and influence customers' changing fashion tastes. Inditex sells off-the-rack items directly to customers (who pay with cash or credit cards), eschews stocking inventory to mitigate fashion risk, and sources raw materials from a vast number of suppliers over whom it has considerable leverage on payment terms. As a result, Inditex has a negative cash conversion cycle, as shown in the table below.

(in millions of EUR)	2021	2020
Accounts receivable	842	715
Inventories	3,042	2,321
Accounts payable	6,199	4,659
Sales	27,716	20,402
Cost of goods sold	11,902	9,013
Days sales outstanding	11	13
Days of inventory on hand	93	94
Days payable outstanding	190	189
Cash conversion cycle	−86	−82

Issuers can shorten their cash conversion cycle in several ways, including the following:

- Reduce days of inventory on hand by discontinuing products or product lines with low or niche demand, by negotiating with suppliers to do more frequent deliveries in order to establish “just in time” inventory levels, and by using data analytics to improve customer demand forecasts and to rationalize stocking levels.
- Reduce days sales outstanding by offering prompt-payment discounts to customers, imposing late fees, tightening credit standards, imposing upfront deposits or accelerating installment payments, and working with third-party collection agencies.
- Increase days payable outstanding by negotiating supplier contracts for longer terms. This approach may be feasible by establishing preferred suppliers—purchasing more in volume in exchange for better terms. However, it may result in suppliers charging higher prices or asking for deposits. The ability to lengthen days payable outstanding is highly dependent on the power dynamics between the company and its suppliers. If a company can purchase a critical component from only one supplier who sells to many others, it may not have the ability to negotiate better terms.

While extending days payable outstanding can improve the cash conversion cycle, suppliers typically offer discounts for prompt payment, such as requiring payment in 30 days but offering a 2% discount if payment is received within 10 days. If a company forgoes this discount in favor of paying in 30 days, it is implicitly borrowing from the

supplier for $30 - 10 = 20$ days at the cost of the forgone discount. One strategy is to borrow from a third party (e.g., a bank) at a relatively low interest rate, pay the supplier early to receive the prompt-payment discount, and later repay the bank. Such a strategy avoids the high cost of supplier financing but preserves cash, as shown in the following example.

EXAMPLE 1

Keown Corporation—Internal versus External Financing

Keown Corporation is an established manufacturer of custom paddleboards operating in the North American market. Keown operates its own manufacturing plant in Canada and sells its paddleboards exclusively through its website to avoid the cost of retail locations.

Most of Keown's sales take place during the North American summer season from May to August. Keown's customers expect orders to be filled immediately, so it must maintain substantial inventory to start the summer season or risk losing sales to competitors. Given the seasonality of the business, Keown is particularly focused on meeting customers' needs.

Since Keown lacks the necessary cash to pay its suppliers within 10 days, the CFO must decide whether to borrow from its bank at an effective annual rate (EAR) of 7.7% to take the prompt-payment discount offered by its supplier of materials or pay in 30 days. The terms from the supplier are 2/10, net 30.

1. Should Keown use the bank loan and pay the supplier within 10 days to receive the 2% discount, or simply forgo the discount and pay the supplier in 30 days?

Solution:

To compare the relative cost of the bank loan with that of the trade credit, we can calculate the effective annual rate on the trade credit. Essentially, we are calculating the interest rate on a loan for which the interest cost is the forgone discount and the term is the additional time Keown gets to pay; in this case, $30 - 10 = 20$ days.

$$\text{EAR of Supplier Financing} = \left(\left(1 + \frac{\text{Discount \%}}{100\% - \text{Discount \%}} \right)^{\frac{\text{Days in Year}}{\text{Payment Period} - \text{Discount Period}}} \right) - 1$$

$$\text{Effective Annual Rate of Supplier Financing} = \left(\left(1 + \frac{2\%}{100\% - 2\%} \right)^{\frac{365}{30-10}} \right) - 1$$

$$\text{Effective Annual Rate of Supplier Financing} = 0.446 \text{ or } 44.6\%$$

Since the effective annual rate of 44.6% on the supplier financing is significantly higher than the 7.7% interest rate on the bank loan, Keown should borrow from its bank. That way, it will still be able to preserve cash but will pay a far lower interest rate on the financing.

A long cash conversion cycle may reflect industry or business model characteristics, but a longer cycle relative to competitors and a lengthening over time are of particular concern for analysts. A longer cycle may signal worsening customer demand, deteriorating customer financial health or credit quality, or the loss of bargaining power with suppliers.

EXAMPLE 2**Cash Conversion for US Discount Retailers**

Consider the following activity ratios for large US discount retailers Walmart Inc., Target Corporation, Costco Wholesale Corporation, The TJX Companies, and Ross Stores for the 2021 calendar year, as shown below.

	Walmart	Target	Costco	TJX	Ross
Days sales outstanding	5	2	3	7	2
Days of inventory on hand	48	68	29	63	61
Days payable outstanding	47	75	34	47	63

1. Which company has the shortest cash conversion cycle? The longest?

Solution:

Cash conversion cycle = DSO + DOH – DPO

Cash conversion cycle for Walmart = 5 days + 48 days – 47 days = 6 days

Cash conversion cycle for Target = 2 days + 68 days – 75 days = –5 days

Cash conversion cycle for Costco = 3 days + 29 days – 34 days = –2 days

Cash conversion cycle for TJX = 7 days + 63 days – 47 days = 23 days

Cash conversion cycle for Ross = 2 days + 61 days – 63 days = 0 days

Target has the shortest cash conversion cycle of the five companies.

2. These companies accept payment from customers at the point of sale in either cash or a debit or credit card. Does this fact align with the activity ratios presented?

Solution:

Yes, because days sales outstanding is small. Debit and credit card payments typically settle in a couple of days, and cash sales are settled immediately.

3. In examining annual reports, you find that approximately 54% of Costco's sales are food or food-related items, a larger percentage than that of the other companies, which sell a greater percentage of apparel and non-food items. Does this fact align with the activity ratios presented?

Solution:

Yes. Companies like Costco that sell perishable goods tend to have a lower number of days of inventory on hand, because inventory must be sold soon after receiving it from suppliers or else it spoils.

In addition to the cash conversion cycle, another measure analysts use to assess the efficiency of business operations is the amount of **working capital** used by the firm, particularly its quantity relative to sales so that it can be compared across time and firms. There are several definitions of working capital in practice. We distinguish between **total working capital**, formally defined in Equation 2 as a broad measure, and **net working capital**, defined in Equation 3 as a measure that excludes items that are less related to the cash conversion cycle or business operations, such as cash, marketable securities, and short-term debt.

Current assets
Minus: Current liabilities
 Total Working Capital

(2)

Current assets, excluding cash and marketable securities
Minus: Current liabilities, excluding short-term and current debt
 Net Working Capital

(3)

To control for size and for comparability across firms, total or net working capital is often expressed as a percentage of annual sales.

Consider the information on Licht Vernieuwend N.V. for the fiscal year ending 31 December 20X2, as shown in Exhibit 6. The total working capital is the difference between the current assets of EUR335 million and the current liabilities of EUR220 million, or EUR115 million. The net working capital excludes cash, marketable securities, and short-term bank loans from the calculation, giving a net working capital of EUR225 million – EUR160 million = EUR65 million.

Exhibit 6: Total and Net Working Capital Extracted from the Licht Vernieuwend N.V. Balance Sheet for the Year Ending 31 December 20X2

	(in millions of EUR)	
Cash	40	
Marketable securities	70	
Accounts receivable	85	85
Inventory	130	130
Prepaid accounts	10	10
Total	335	225
Accounts payable	130	130
Accrued expenses	30	30
Short-term bank loan	60	
Total	220	160
Total working capital	115	
Net working capital		65

The cash conversion cycle and the ratio of working capital to sales are interrelated. Since receivables and inventories are often large components of short-term assets and payables are a large component of short-term liabilities, a short cash conversion cycle is associated with a low ratio of working capital to sales and vice versa.

INDITEX'S NEGATIVE CASH CONVERSION CYCLE AND WORKING CAPITAL

Continuing the earlier example, owing to Inditex's business model—which includes prompt payment from customers for off-the-rack apparel, limited runs of inventories with fast turnover, and a vast number of suppliers over which it has leverage—Inditex has not only a negative cash conversion cycle but also negative net working capital and negative ratios of net working capital to sales, as shown in the table below.

(in millions of EUR)	2021	2020
Accounts receivable	842	715
Inventories	3,042	2,321
Accounts payable	6,199	4,659
Net working capital	-2,315	-1,623
As a % of sales	-8.4%	-8.0%
Sales	27,716	20,402
Cost of goods sold	11,902	9,013
Days sales outstanding	11	13
Days of inventory on hand	93	94
Days payable outstanding	190	189
Cash conversion cycle	-86	-82

A high ratio of working capital to sales may be a result of industry characteristics, such as in the spirits industry, where inventory must age for several years before being sold to customers, or in the pharmaceutical industry, where companies hold a large amount of inventory, sometimes to comply with regulations. Besides cases of necessity, as illustrated in Example 1, or cases of compliance with regulations, issuers are generally better off holding less working capital and either using capital elsewhere on higher-return projects or returning capital to investors.

QUESTION SET



- Classify each of the following actions by an issuer based on the likely effect on its cash conversion cycle:

Action	Effect on the Cash Conversion Cycle	
	Shorten	Lengthen
Offering larger discounts to its customers for payments received before the due date		
Paying suppliers sooner		
Lowering reliance on just-in-time inventory methods while increasing safety stocks of inventory		
Negotiating longer payment periods with its suppliers		
Tightening credit standards for its customers		

Solution:

Action	Effect on the Cash Conversion Cycle	
	Shorten	Lengthen
Offering larger discounts to its customers for payments received before the due date	✓	
Paying suppliers sooner		✓

Action	Effect on the Cash Conversion Cycle	
	Shorten	Lengthen
Lowering reliance on just-in-time inventory methods while increasing safety stocks of inventory		✓
Negotiating longer payment periods with its suppliers	✓	
Tightening credit standards for its customers	✓	

2. Identify the issuer with the longest cash conversion cycle and explain the effects of that length on that issuer relative to the other issuers.

	Issuer A	Issuer B	Issuer C
Days of inventory on hand	20	35	15
Days payable outstanding	15	10	5
Days sales outstanding	30	25	30

Solution:
Using:

$$\text{Cash conversion cycle} = \frac{\text{Days of inventory on hand}}{\text{Days of inventory on hand}} + \frac{\text{Days sales outstanding}}{\text{Days sales outstanding}} - \frac{\text{Days payable outstanding}}{\text{Days payable outstanding}}$$

	Issuer A	Issuer B	Issuer C
Days of inventory on hand	20	35	15
Plus: Days sales outstanding	30	25	30
Minus: Days payable outstanding	15	10	5
Cash conversion cycle	35	50	40

Issuer B has the longest cash conversion cycle, 50 days. By having the longest cycle, Issuer B is more reliant on alternative financing to support its operations relative to the other issuers.

3. Assuming no change in days sales outstanding and days of inventory on hand, an issuer in need of cash flow that forgoes the discount offered by its vendor for payments within 10 days and chooses to pay on the due date in 30 days is:

- shortening its cash conversion cycle.
- lengthening its cash conversion cycle.
- not affecting its cash conversion cycle.

Solution:
B is correct. The issuer that uses the vendor financing by delaying payments is increasing its days payable outstanding and thus lengthening its cash conversion cycle. The issuer is reducing its need for liquidity by taking advantage of the vendor financing at the cost of the forgone discount.

4. An issuer with limited cash flow is deciding which of its suppliers' credit terms are least costly. Which of the following credit terms offered to the issuer by its suppliers have the *lowest* effective interest rate?

- A. 1/10, net 50
- B. 2/15, net 40
- C. 3/15, net 60

Solution:

A is correct. The implicit financing cost that the issuer faces when forgoing a discount that the supplier or vendor offers is based on the amount of the forgone discount and length of the payment period beyond the discount period; 1/10, net 50 would permit the issuer to borrow for $50 - 10 = 40$ days at a cost of only 1% of the purchase price (the forgone discount). The calculations for the cost of financing for each set of credit terms, expressed as an effective annual rate, are as follows:

$$\text{EAR of Supplier Financing} = \left(\left(1 + \frac{\text{Discount \%}}{100\% - \text{Discount \%}} \right)^{\frac{\text{Days in Year}}{\text{Payment Period} - \text{Discount Period}}} \right) - 1$$

$$\text{EAR of 1/10, net 50} = \left(\left(1 + \frac{1\%}{100\% - 1\%} \right)^{\frac{365}{50-10}} \right) - 1$$

$$\text{EAR of 1/10, net 50} = 0.096 \text{ or } 9.6\%$$

$$\text{EAR of 2/15, net 40} = \left(\left(1 + \frac{2\%}{100\% - 2\%} \right)^{\frac{365}{40-15}} \right) - 1$$

$$\text{EAR of 2/15, net 40} = 0.343 \text{ or } 34.3\%$$

$$\text{EAR of 3/15, net 60} = \left(\left(1 + \frac{3\%}{100\% - 3\%} \right)^{\frac{365}{60-15}} \right) - 1$$

$$\text{EAR of 3/15, net 60} = 0.280 \text{ or } 28.0\%$$

5. An issuer is comparing a bank loan at a rate of 15% with taking advantage of a supplier's terms of 1/14, net 30, paying on day 14. The best decision in terms of the lower cost of financing is to:

- A. forgo the discount and use the supplier's financing to pay on day 30.
- B. borrow from the bank to take advantage of the trade credit terms.
- C. use either option because the cost of the bank loan and the cost of the trade credit are identical.

Solution:

B is correct.

The cost of the supplier's trade credit, expressed as an effective annual rate, is 25.769%, which is higher than the 15% interest rate on the bank loan.

$$\text{EAR of Supplier Financing} = \left(\left(1 + \frac{\text{Discount \%}}{100\% - \text{Discount \%}} \right)^{\frac{\text{Days in Year}}{\text{Payment Period} - \text{Discount Period}}} \right) - 1$$

$$\text{EAR of 1/14, net 30} = \left(\left(1 + \frac{1\%}{100\% - 1\%} \right)^{\frac{365}{30-14}} \right) - 1$$

EAR of 1/14, net 30 = 0.25769 or 25.769%

A and C are incorrect, because the bank loan rate of 15% is lower than the effective annual rate, 25.769%, on the supplier's trade credit.

6. Consider the following balance sheet for an issuer:

Cash	100
Marketable securities	20
Accounts receivable	600
Inventory	800
Prepaid expenses	30
Property, plant, and equipment	10,000
Intangibles	500
Total assets	12,050
Accounts payable	980
Accrued expenses	70
Short-term debt	1,000
Long-term debt	2,000
Shareholders' equity	8,000
Total liabilities and equity	12,050

7. The issuer's net working capital is *closest* to:

- A. -500.
- B. 380.
- C. 500.

Solution:

B is correct. Net working capital is defined as:

Current assets, excluding cash and marketable securities
Minus: Current liabilities, excluding short-term and current debt
 Net Working Capital

Current assets, excluding cash and marketable securities:

Accounts receivable	600
Inventory	800
Prepaid expenses	30
Sum	1,430

Current liabilities, excluding short-term and current debt:

Accounts payable	980
Accrued expenses	70
Sum	1,050
Net working capital	380

A is incorrect, because cash, marketable securities, and short-term debt are mistakenly included in the calculation, resulting in the calculation of total working capital instead of net working capital.

C is incorrect, because cash and marketable securities are mistakenly included in the calculation.

3

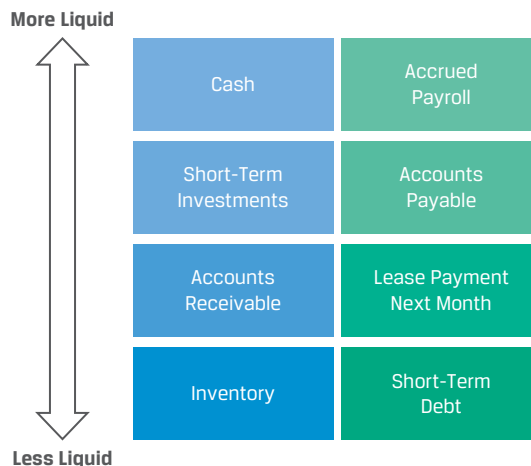
LIQUIDITY



explain liquidity and compare issuers' liquidity levels

Liquidity for an individual asset or liability is its nearness to cash or settlement. Cash is already cash, so it is the most liquid asset, while inventories can take issuers significant time to sell and ultimately collect cash from customers and are thus less liquid than cash. Similarly, accounts payable due to a supplier in five days are more liquid than a lease payment due next month. Issuers report assets and liabilities on their balance sheet in descending order of liquidity. Assets and liabilities that are not expected to convert into cash or settle within 12 months are presented as long-term assets and liabilities. Exhibit 7 depicts the relative liquidity of short-term assets and liabilities.

Exhibit 7: Relative Liquidity of Short-Term Assets and Liabilities



Liquidity for an *issuer* refers to its ability to meet its short-term liabilities. It is determined by the amounts and liquidity of its short-term assets and liabilities, which in turn are determined by an issuer's business model and cash conversion cycle. For example, if an issuer has 20 in total short-term liabilities and 100 in cash, it is highly liquid and will face no problem paying its short-term liabilities. If the reverse is true and the company has 20 in cash and 100 in short-term liabilities, the company will have to seek other sources of liquidity to meet its short-term liabilities.

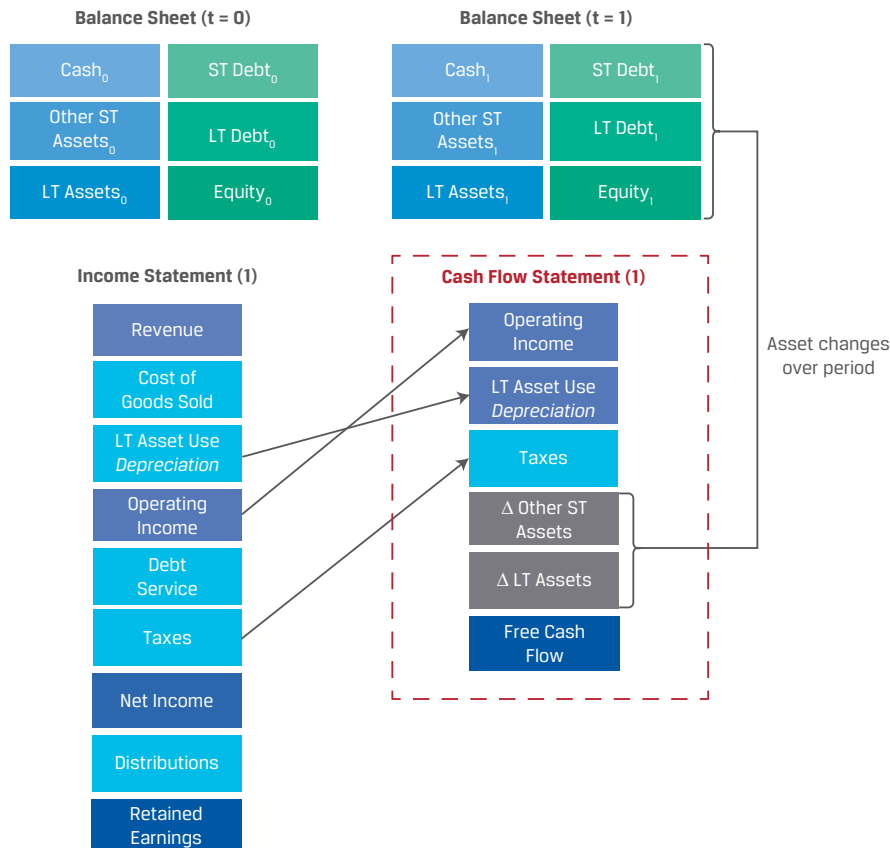
Primary Liquidity Sources

Primary sources of liquidity represent the most readily accessible cash available to the company and include the following:

- *Cash and marketable securities on hand*, which is cash available in bank accounts or held as currency or securities that could be sold quickly without significant loss of value.
- *Borrowings*, from banks, bondholders, or suppliers' trade credit. While this source can yield cash to settle near-term obligations, it creates another obligation that will need to be repaid in the future.
- *Cash flow from the business*, though it takes time to generate, is a substantial source of liquidity for profitable firms. For example, if a firm has a liability of 40 due in six months but expects to generate 100 in cash from its operations over the next six months, it will not have to use cash on hand or borrowings to settle this liability. However, firms in an earlier stage of growth or earning net losses may not generate sufficient cash flows to meet liabilities.

While cash and securities on hand and borrowings are an important source of liquidity in the short run, an issuer's cash flow from its business is the primary long-term source of liquidity. For that reason, financial analysts closely track this information using a financial statement reported by issuers known as the **statement of cash flows**, the basic elements of which are shown in Exhibit 8.

Exhibit 8: Statement of Cash Flows for a Firm



There are several measures of cash flows that analysts use or calculate from the statement of cash flows. **Cash flow from operations** is a cash profit measure over a period for an issuer's primary business activities, calculated as:

$$\begin{aligned}
 &\text{Cash received from customers} \\
 &\text{Plus: Interest and dividends received on financial investments} \\
 &\text{Minus: Cash paid to employees and suppliers} \\
 &\text{Minus: Taxes paid to governments} \\
 &\text{Minus: Interest paid to lenders} \\
 &\text{Cash flows from operations}
 \end{aligned}
 \tag{4}$$

However, this measure does not account for capital investments (covered in a subsequent learning module) that issuers make to improve operations or expand. Therefore, analysts calculate an additional measure known as **free cash flow** that accounts for this factor:

$$\begin{aligned}
 &\text{Cash flows from operations} \\
 &\text{Minus: Investments in long-term assets} \\
 &\text{Free cash flow}
 \end{aligned}
 \tag{5}$$

An alternative measure of free cash flow adds back interest paid to lenders in order to compute cash flows that are available for both debt and equity investors. This important topic will be addressed in greater detail later in the curriculum.

Secondary Liquidity Sources

While primary liquidity sources are preferable and are unlikely to affect a firm's ongoing operations, a secondary source may have to be used. Secondary sources of liquidity include the following:

- Suspending or reducing dividends to shareholders.
- *Delaying or reducing capital expenditures*, which will preserve cash in the near term but may result in missed opportunities and impair long-term value.
- *Issuing equity*, by issuing shares in the public markets or privately to select investors. While equity issuance provides cash, it comes at the cost of dilution for existing shareholders.
- *Renegotiating contract terms*, such as refinancing short-term debt to long-term debt; seeking concessions on interest, rent, and/or lease payments; restructuring debt covenants; and renegotiating payment or delivery terms with customers and suppliers.
- *Selling assets*, which depends on the degree to which short-term and/or long-term assets can be liquidated and converted into cash without substantial loss in value.
- *Filing for bankruptcy* protection and reorganization to continue operations while restructuring debt contracts and possibly selling assets.

The use of secondary sources often signals a company's deteriorating financial health, as it seeks to increase its cash position at a relatively high price or disadvantage to existing debt and equity holders, the company's employees, and other stakeholders. For example, early in the COVID-19 pandemic, airlines raised funds to shore up their cash positions as revenue severely declined: Lufthansa raised EUR600 million through a convertible bond offering, Singapore Airlines raised SGD\$8.8 billion using a rights issue, and Delta Airlines deferred USD500 million in capital expenditures.

Example 3 shows the net proceeds from the primary and secondary sources of liquidity for an issuer in a liquidity crisis. It also shows the liquidation costs incurred by the company when those sources are used to raise funds. These costs can include the fees and commissions involved with the asset sale as well as any discount in asset value due to liquidity issues.

EXAMPLE 3**Estimating Keown Corporation's Cost of Liquidity**

1. Keown Corporation is facing a liquidity crisis. As an analyst, you have identified four potential actions that Keown could take to raise funds. Your estimates of fair value for Keown's assets and liquidation costs are shown below.

Source of Funds	Fair Value (millions of CAD)	Liquidation Costs (%)
Sell short-term marketable securities	10	0
Sell select inventories and receivables	20	10
Sell excess real estate property	50	15
Sell a subsidiary of the firm	30	20

The liquidation costs include the fees and commissions for selling an asset as well as any reduction in value due to its illiquidity. In this case, liquidation costs for marketable securities are zero.

Net of liquidation costs, how much liquidity can Keown raise if all four sources of funds are used, and what are Keown's total liquidation costs?

- A. 110 million, 9.5 million
- B. 94.5 million, 15.5 million
- C. 125.5 million, 15.5 million

Solution:

The gross and net amounts of liquidity raised are summarized in this table:

Source of Funds	Fair Value (millions of CAD)	Liquidation Costs		Net Proceeds (millions of CAD)
		%	(millions of CAD)	
Marketable securities	10	0	0	10
Inventories and receivables	20	10	2	18
Real estate property	50	15	7.5	42.5
Subsidiary of the firm	30	20	6	24
Total			15.5	94.5

B is correct. Total net proceeds from the sales are CAD94.5 million, and the total liquidation costs incurred are CAD15.5 million.

Factors Affecting Liquidity: Drags and Pulls

A company's cash conversion cycle has significant effects on its liquidity position. Two classifications for negative forces on a firm's liquidity are drags and pulls on liquidity. A **drag on liquidity** occurs when cash inflows lag, creating a shortfall due to a decline in available funds. Alternatively, a **pull on liquidity** involves an acceleration of cash outflows or a situation where trade credit availability is limited, requiring companies to expend funds before they receive proceeds from sales that could offset the liability.

Major drags on receipts involve pressures from credit management and deterioration in other assets and include the following:

- *Uncollected receivables.* The longer customer receipts are outstanding, the greater the chance they will not be collected. As we will see in the following lesson, this drag is often measured by the average number of days that receivables are outstanding as well as the level of customer payment delinquencies as a percentage of receivables.
- *Obsolete inventory.* If inventory of finished goods is held for long periods, it might be an indication that it is no longer in demand by customers or can be sold only at a discounted price.
- *Borrowing constraints.* If credit conditions tighten due to adverse economic conditions, short-term debt becomes more expensive or unavailable.

In many cases, drags can be reduced by stricter enforcement of credit and collection practices, but this approach may also drive sales lower if customers are unwilling or unable to make a purchase if cash payment is required.

Managing cash outflows is of equal importance. If suppliers and other vendors who offer credit terms have greater market power over a firm or believe its financial position is weak, they might demand payment terms that strain the company's liquidity. Major pulls on liquidity include the following:

- *Making payments early.* By paying vendors, employees, or others before the due dates with no financial benefit, companies forgo the use of funds. Effective payment management means *not* making early payments.
- *Reduced credit limits.* If a company has a history of late payments, suppliers may cut the firm's credit outstanding at any time.
- *Limits on short-term lines of credit.* If a company's bank limits lending to it, the company may face liquidity constraints. Credit line restrictions can be government mandated, market related, or simply company specific.
- *Low liquidity positions.* Many companies face chronic liquidity shortages, often due to industry conditions or a weak financial position. This pull may be exacerbated by an aggressive approach to working capital management.

The following example addresses changes affecting Keown Corporation's liquidity position.

EXAMPLE 4

Drags and Pulls on Keown Corporation's Liquidity

1. Keown Corporation is experiencing liquidity challenges. As an analyst, you note three recent trends related to Keown's working capital:
 1. An increase in average days sales outstanding is a drag on liquidity.
 2. An increase in days of inventory on hand is a drag on liquidity.

3. An increase in credit limits by lenders is a pull on liquidity.

Which trend does *not* contribute to the firm's liquidity challenges?

- A. The change in average days sales outstanding
- B. The change in days of inventory on hand
- C. The change in credit limits

Solution:

C is correct. The increase in credit limits is not a pull on liquidity but is in fact the opposite: it provides liquidity.

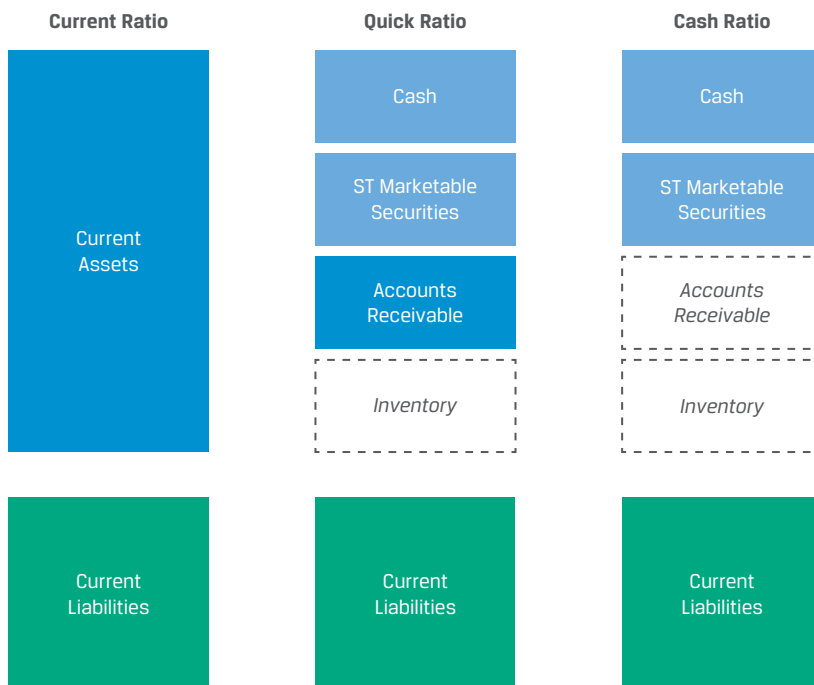
A is incorrect, because an increase in days sales outstanding is a drag on liquidity as it results in slower or delayed cash inflows.

B is incorrect, because higher days of inventory on hand is a drag on liquidity as it extends the cash conversion cycle.

Measuring and Evaluating Liquidity

The less liquid the company, the greater the risk it will experience financial distress if business conditions change unfavorably. Financial analysts are keenly interested in common measures to quantify and track changes in firm liquidity over time as well as to compare issuers' liquidity levels. To compare firms of different sizes with varying sources and uses of liquidity, financial *ratios* are frequently used. Liquidity assessment using financial ratios usually involves both **liquidity ratios** and the activity ratios introduced earlier in Example 2. Exhibit 9 summarizes the three most used liquidity ratios.

Exhibit 9: Key Liquidity Ratios



Liquidity ratios gauge a firm's ability to meet its short-term obligations from existing current assets. The broadest measure of liquidity is the **current ratio**, or ratio of current assets to current liabilities:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad (6)$$

Recall from an earlier lesson that we defined total working capital as the *difference* between current assets and current liabilities. A firm with positive total working capital would therefore have a current ratio greater than one, with a higher current ratio representing greater liquidity under this aggregate measure, which includes all short-term assets.

This broad ratio is usually considered together with two narrower liquidity measures that exclude less liquid short-term assets. Recall that, unlike cash or short-term marketable securities, inventory and receivables are less readily convertible into cash. The **quick ratio** is a ratio of short-term assets to short-term liabilities that excludes inventory:

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Short-term marketable instruments} + \text{Receivables}}{\text{Current liabilities}} \quad (7)$$

A firm able to meet its short-term obligations *without* liquidating inventory would therefore have a quick ratio greater than one. However, this scenario would require the firm to collect all receivables without delays or customer delinquencies. The **cash ratio** compares cash and short-term marketable securities with current liabilities and is the most conservative of these measures:

$$\text{Cash ratio} = \frac{\text{Cash} + \text{Short-term marketable instruments}}{\text{Current liabilities}} \quad (8)$$

A cash ratio equal to or greater than one indicates that a firm could satisfy all its short-term obligations without having to wait to sell inventory or collect receivables.

KNOWLEDGE CHECK



Consider the following balance sheet information for Licht Vernieuwend N.V. for the fiscal year 20X2 and the previous year, 20X1:

(in millions of EUR)	20X2	20X1
Cash	40	45
Marketable securities	70	90
Accounts receivable	85	90
Inventory	130	66
Prepaid accounts	10	15
Net plant, property, and equipment	1,000	950
Intangibles	90	75
Total assets	1,425	1,331
Accounts payable	130	140
Accrued expenses	30	15
Short-term bank loan	60	70
Long-term debt	400	400
Equity	805	706
Total liabilities and equity	1,425	1,331

1. Has net working capital changed from 20X1 to 20X2? If so, what was the primary driver of the change?

Solution:

Net working capital is defined as:

Current assets, excluding cash and marketable securities

Minus: Current liabilities, excluding short-term and current debt

Net Working Capital

Licht Vernieuwend N.V.'s net working capital each year is equal to:

<i>(in millions of EUR)</i>	20X2	20X1
Accounts receivable	85	90
Plus: Inventory	130	66
Plus: Prepaid accounts	10	15
Minus: Accounts payable	(130)	(140)
Minus: Accrued expenses	(30)	(15)
Net working capital	65	16

Licht Vernieuwend N.V.'s net working capital has increased from EUR16 million in 20X1 to EUR65 million in 20X2, largely owing to the increased investment in inventory from EUR66 million to EUR130 million.

2. Has the liquidity changed from 20X1 to 20X2 based on the:

- i. cash ratio?
- ii. quick ratio?
- iii. current ratio?

Solution:

- i. The cash ratio is defined as:

$$\text{Cash ratio} = \frac{\text{Cash} + \text{Short-term marketable instruments}}{\text{Current liabilities}}$$

$$\text{Licht's cash ratio, 20X1} = \frac{45 + 90}{140 + 15 + 70} = 0.60$$

$$\text{Licht's cash ratio, 20X2} = \frac{40 + 70}{130 + 30 + 60} = 0.50$$

Based on the cash ratio, Licht Vernieuwend N.V.'s liquidity has declined from 20X1 to 20X2.

- ii. The quick ratio is defined as:

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Short-term marketable instruments} + \text{Receivables}}{\text{Current liabilities}}$$

$$\text{Licht's quick ratio, 20X1} = \frac{45 + 90 + 90}{140 + 15 + 70} = 1.00$$

$$\text{Licht's quick ratio, 20X2} = \frac{40 + 70 + 85}{130 + 30 + 60} = 0.89$$

Based on the quick ratio, Licht Vernieuwend N.V.'s liquidity has declined from 20X1 to 20X2.

iii. The current ratio is defined as:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$\text{Licht's current ratio, 20X1} = \frac{45 + 90 + 90 + 66 + 15}{140 + 15 + 70} = 1.36$$

$$\text{Licht's current ratio, 20X2} = \frac{40 + 70 + 85 + 130 + 10}{130 + 30 + 60} = 1.52$$

Based on the current ratio, Licht Vernieuwend N.V.'s liquidity has increased from 20X1 to 20X2.

3. Given the changes in liquidity ratios in Question 2, did the issuer become more or less liquid based on the most conservative liquidity ratio?

Solution:

The most conservative liquidity ratio is the cash ratio, as it measures the ability of an issuer to settle near-term obligations using only the most liquid assets: cash and short-term marketable instruments. Based on the cash ratio, Licht Vernieuwend N.V.'s liquidity has declined from 20X1 to 20X2.

QUESTION SET



1. Classify each of the following as either a drag on liquidity or a pull on liquidity:

Action	Effect on Liquidity	
	Drag	Pull
Customers delaying payments		
Inventory becoming obsolete		
Paying suppliers before due dates without a discount incentive		
Lender reducing a line of credit		
Vendors reducing trade credits		

Solution:

Action	Effect on Liquidity	
	Drag	Pull
Customers delaying payments	✓	
Inventory becoming obsolete	✓	
Paying suppliers before due dates without a discount incentive		✓
Lender reducing a line of credit		✓
Vendors reducing trade credits		✓

2. Consider the following information from the Statement of Cash Flows for the Lucor Corporation:

Net income	1,000
Cash flow from operations	1,400
Cash flow from investing	(700)
Investment in long-term assets	(800)
Cash flow from financing	500
Funds from debt issue	600
Total net cash flow for the period	1,200

Lucor's free cash flow for this period is *closest* to:

- A. 200.
- B. 600.
- C. 700.

Solution:

B is correct. Free cash flow is the difference between cash flow from operations and the investment in long-term assets, or
Free cash flow = 1,400 – 800 = 600

3. An issuer is facing a liquidity crisis. Based on these estimations, complete the following table:

	Fair Value (millions of USD)	Liquidation Cost (% of fair value)	Liquidation Cost (millions of USD)	Net Proceeds (millions of USD)
Selling a production plant	1,000	20		
Selling short-term marketable securities	100	0		
Selling receivables	900	10		
Selling inventory	600	12		
Total				

Solution:

	(1) Fair Value (millions of USD)	(2) Liquidation Cost (% of fair value)	(3) Liquidation Cost (millions of USD)	(4) Net Proceeds (millions of USD)
Selling a production plant	1,000	20	200	800
Selling short-term marketable securities	100	0	0	100
Selling receivables	900	10	90	810
Selling inventory	600	12	72	528
Total				2,238

The liquidation cost in column (3) is the result of multiplying the column (1) and (2) entries. The net proceeds in column (4) are the result of subtracting the liquidation cost from the fair value, column (1). The total net proceeds is the sum of the net proceeds from each source in column (4).

4. Rank the following ratios from smallest (rank 1) to largest (rank 3) for a company that has inventory, accounts receivable, and payables:

Ratio	Rank
Cash ratio	
Current ratio	
Quick ratio	

Solution:

The denominator is the same for each of these ratios (current liabilities), so the differences among these ratios are attributable to the numerator. In the case of the cash ratio, the numerator is simply cash and short-term marketable securities. In the case of the quick ratio, receivables are added to cash and short-term marketable securities in the numerator. Finally, the current ratio has all current assets in the numerator.

Ratio	Rank
Cash ratio	1
Current ratio	3
Quick ratio	2

5. An issuer has the following current assets and current liabilities on its balance sheet:

Cash	200
Marketable securities	40
Accounts receivable	600
Inventory	800
Prepaid expenses	60

Accounts payable	500
Accrued expenses	50
Short-term debt	600

The issuer's cash and quick ratios, respectively, are closest to:

- A. 0.2087; 0.7304.
- B. 0.4363; 1.5273.
- C. 0.5455; 1.6364.

Solution to 5:

A is correct.

The cash ratio is:

$$\text{Cash ratio} = \frac{200 + 40}{1,150} = 0.2087$$

The quick ratio is:

$$\text{Quic ratio} = \frac{200 + 40 + 600}{1,150} = 0.7304$$

MANAGING WORKING CAPITAL AND LIQUIDITY

4



describe issuers' objectives and compare methods for managing working capital and liquidity

The primary goal of working capital and liquidity management is to maximize firm value while maintaining ready access to funds necessary for day-to-day operations and obligations to creditors. Often, reaching this goal involves shortening the cash conversion cycle, estimating required liquidity, and minimizing any excess so that cash can be invested elsewhere in higher-return projects or returned to shareholders.

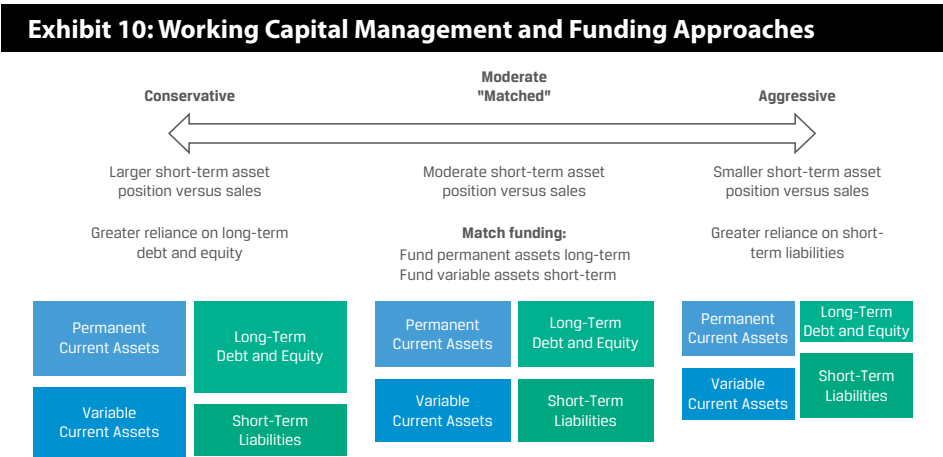
The realistic bounds of working capital and liquidity management depend on a firm's business model. For example, some types of manufacturing may involve more complex and lengthy conversion of inputs into finished goods, which may require that inventory be held for weeks or months. A distributor of less complex goods, however, may have just a few days of inventory on hand. Some businesses in the same industry require more investment in inventory and receivables than others. For example, retail businesses with multiple sales locations where finished goods are available for purchase, as well as those that offer customers sales on credit versus immediate payment, will need more working capital (in inventories and/or accounts receivable). In contrast, service and software businesses may have far lower working capital requirements, as they do not have inventories and may receive payments from customers upfront.

Working Capital Management

Firms estimate working capital requirements by first determining optimal working capital requirements in relation to revenue and then forecasting future working capital levels based on their revenue forecast. In doing so, firms often distinguish between, on the one hand, base levels of inventory, staffing, and receivables that are *permanent*

current assets and relatively constant over time and, on the other hand, additional inventory and labor needed during a company’s seasonal peak production and sales period or during a growth phase that are considered *variable* current assets. During this process, managers also weigh the cost versus benefit of different inventory and receivables management policies. For example, higher inventory levels may reduce the likelihood of a shortfall due to supplier risk or unanticipated demand but may also increase the obsolescence risk of existing inventory. Although more accommodative sales credit policies that increase receivables may help drive sales or revenue growth, they may also lead to higher billing costs and increased payment delinquencies over time.

Companies take different approaches to both the *size* of current assets and the *composition* of financing used to support those assets. Exhibit 10 outlines three different approaches to working capital management, from the highest cost (i.e., higher levels of current assets funded on a longer-term basis) to the lowest (fewer assets funded on a shorter-term basis) for a given level of sales.



A conservative approach to working capital management involves more cash, receivables, and inventory relative to sales, with a greater reliance on long-term funding sources. While this strategy provides a firm with the most financial flexibility to meet its needs, it is also typically the costliest. The pros and cons of a conservative working capital approach are outlined in Exhibit 11.

Exhibit 11: Conservative Working Capital Approach: Pros and Cons	
Pros	Cons
Stable, permanent financing avoids rollover risk associated with short-term debt	Long-term debt typically involves a higher interest rate
Financing costs are known upfront	High cost of equity
Certainty of working capital needed to purchase the necessary inventory	Permanent financing eliminates the opportunity to borrow only as needed

Pros	Cons
Extended payment term reduces short-term cash needs for debt service	A longer lead time is often required to establish the financing position
Higher flexibility during market disruptions that can be covered by larger cash or marketable securities positions	Long-term debt may involve more restrictions on business operations

Firms in an early-growth phase are more likely to consider a conservative approach due to limited access to short-term debt. More established companies with higher profit margins pursuing such a policy may also be able to pass these higher financing costs on to customers. Firms may choose to pursue a conservative working capital strategy for a number of other reasons:

- Reduced need to access capital during times of market stress
- Expectation of flat to rising interest rates
- Preference for cash flow stability over rollover risk of short-term debt
- Benefits of greater certainty and access to more permanent capital, which are perceived to offset the higher associated financing cost

An aggressive working capital approach, in contrast, seeks to minimize excess cash, receivables, and inventory relative to sales, with more reliance on short-term funding to meet variable and some permanent working capital needs. With fewer committed resources to support current assets, the firm has reduced its short-term financial flexibility in exchange for higher returns for investors.

The pros and cons of an aggressive working capital strategy are outlined in Exhibit 12.

Exhibit 12: Aggressive Working Capital Approach: Pros and Cons

Pros	Cons
Lower financing cost	Interest expense may fluctuate as rates on short-term financing change
Flexibility to borrow only as needed reduces overall interest expense	May result in higher short-term cash needs to satisfy debt maturities
Short-term debt usually involves fewer restrictions on business operations	Rollover risk of short-term debt increases bankruptcy risk, particularly during market disruptions
Flexibility to refinance if rates decline	May have to rely on more costly trade credit, tighten customer credit, or sell receivables if unable to refinance at favorable terms

Firms in industries with lower profit margins may consider pursuing a more aggressive working capital policy to gain a cost advantage over competitors. While greater reliance on short-term financing lowers debt cost versus a conservative approach, a firm also faces greater exposure to debt rollover risk in times of market stress. This exposure affected many firms during the 2008–2009 financial crisis and in early 2020 during the initial phase of the COVID-19 pandemic.

Firms choosing an aggressive working capital policy may do so for one or more of the following additional reasons:

- Ability to forecast future sales and cash needs with a high degree of precision
- Expectation of stable or falling interest rates
- Expectation that firm will shorten its cash conversion cycle (i.e., shorten its accounts receivable and inventory period and extend its accounts payable period)
- Ability to quickly liquidate inventory and minimize accounts receivable

A moderate working capital approach strikes a balance between the use of long-term financing for more permanent current asset needs and short-term debt for variable needs. Since stable, predictable needs are met with long-term financing and less predictable seasonal or growth-based needs are met with short-term resources, this method is often also referred to as a “matched” approach.

The pros and cons of a moderate working capital strategy are outlined in Exhibit 13.

Exhibit 13: Moderate Working Capital Approach: Pros and Cons

Pros	Cons
Lower financing cost versus conservative approach; lower risk than aggressive approach	Access to short-term capital may be limited for seasonal or growth needs
Flexibility to increase financing for seasonal requirements or growth as needed	Uncertain cost of short-term debt for variable needs during market disruptions
Diversified sources of funding, with a more disciplined approach to balance sheet management	May have to rely on more costly trade credit to meet seasonal or growth needs if unable to refinance at favorable terms

Under a moderate approach, firms face lower financing costs than under a more conservative policy, with lower refinancing risk relative to a more aggressive working capital strategy. While these firms may also pursue measures to reduce working capital and shorten their cash conversion cycle, the use of long-term debt and equity to support permanent needs allows for more gradual changes in doing so. Other reasons a firm might pursue a moderate approach to working capital management include the following:

- Ability to accurately forecast base current asset requirements, with less certainty surrounding variable needs
- Reduced financing costs relative to a conservative approach, with lower roll-over risk and greater financial flexibility than a more aggressive approach
- To balance the use of less costly short-term financing with the stability and certainty of permanent working capital supported by long-term financing

The interaction between a firm’s sales strategy and its working capital approach is an important consideration for financial analysts. For example, extending more credit, or more generous credit terms, to customers in order to boost sales will also increase working capital. In addition to an increase in accounts receivable, a firm may well face rising customer payment delinquencies, both of which require additional financing. The added cost of monitoring, billing, and collecting receivables over a longer period, as well as higher borrowing costs, must be weighed against the additional profit generated under the new strategy.

Effective management of liquidity is a core finance function for most firms. Even profitable companies can encounter financial difficulties by failing to ensure they have sufficient liquidity to meet current liabilities.

EXAMPLE 5

Changes to Keown Corporation's Credit Policy

1. Keown Corporation is considering an increase in the line of credit it offers to new customers as its sales manager believes doing so will lead to increased sales. What would be the expected impact on Keown's short-term funding needs if this change were made?
 - A. The company would reduce its inventory levels.
 - B. The company would likely collect faster, reducing its receivables.
 - C. The company would have an increased need for working capital.
 - D. The company could pay its suppliers sooner, reducing its accounts payable.
 - E. The company would not see any change in working capital needs as a result of the change.

Solution:

C is correct. The company would likely need more short-term funding to support the expected increase in required inventory and accounts receivable resulting from an increase in sales.

Liquidity and Short-Term Funding

As described in a prior lesson, liquidity involves a firm's relative ability to convert resources into cash to meet immediate obligations. For most firms, this ability includes using existing cash balances, cash flow from operations, or borrowings. Firms can maximize financial flexibility by developing a short-term financing strategy and regularly evaluating available alternatives to fund themselves. Companies that fail to sufficiently explore available options or to take advantage of cost savings from available forms of financing are more likely to face higher financing costs or even financial distress, in which they are unable to borrow from any source.

A prudent short-term financing strategy (when to borrow and in what form) achieves several objectives, including the following:

- Maintaining sufficient and diversified sources of credit to fund *ongoing* cash needs. While many firms have a primary source of short-term funding, such as trade credits and credit facilities, a company should ideally ensure it has additional sources of financing available to reduce reliance on one lender or type of funding.
- Securing adequate funding capacity to handle the firm's *changing* cash needs. This objective may involve accommodation of peak seasonal needs or planned growth.
- Confirming that financing rates offered, as well as associated terms and conditions, are competitive and understanding how these rates might change under different capital markets and economic conditions.
- Ensuring that both implicit (e.g., the cost of supplier financing discussed earlier) and explicit funding costs are considered in calculating the company's effective cost of borrowing.

A firm's industry, size, location, and other factors may also influence its approach to short-term funding in the following ways:

- *Size.* A company's size is an important determinant of available financing alternatives. For example, a small, privately held firm might be limited to short-term credit advances from a single bank, while very large firms are able to access short-term fixed-income markets, among other sources. Many funding alternatives involve either a minimum size or fixed costs, making them prohibitively expensive or unavailable for small and midsize companies.
- *Creditworthiness.* A firm's creditworthiness determines not only whether a loan will be approved by a lender and the rate it will pay, but also whether the loan contains terms and conditions that restrict the firm's operations. For example, a lender may impose borrowing conditions on a less credit-worthy firm that restrict its ability to sell or use its assets for different purposes. This topic will be covered in greater detail in later learning modules.
- *Legal considerations.* Some firms in emerging or frontier markets with less well-defined legal systems may have fewer funding alternatives from financial intermediaries or financial markets than firms in developed economies. As a result, they may rely more heavily on trade credits from suppliers.
- *Regulatory considerations.* Several industries in developed markets are highly regulated. Firms in these industries, such as utilities or banks, may be restricted in both how much they can borrow and the type of borrowing they can access. In other instances, they may have access to unique sources of short-term funding unavailable to other firms. For example, financial institutions can borrow and lend central bank reserves with one another and can also directly access central bank funding. The funding of financial institutions will be addressed in detail later in the curriculum.
- *Underlying assets.* Depending on their business model, companies may have assets, such as inventory, that are considered attractive as collateral for secured short-term funding.

For firms of any size, industry, or location, proper planning enables a company to manage its short-term debt needs more efficiently. For example, forecasting cash positions over a cash conversion cycle and beyond can help firms reduce the likelihood of financial distress under adverse market conditions. Matching the timing of debt maturities to expected cash receipts and spacing debt maturities out over time can also help reduce short-term funding risk.

KNOWLEDGE CHECK: EVALUATING SHORT-TERM FINANCING CHOICES



1. Which of the following factors should a company consider when evaluating short-term financing choices?
 - A. The cost of the funds borrowed
 - B. The flexibility offered by the source
 - C. The ease with which the funds can be accessed
 - D. Legal or regulatory constraints that might favor one source over another

- E. All of the above

Solution:

E is correct. The cost of funds for a company is the most obvious item to consider, but it may choose to borrow at a slightly higher cost after taking all the other items into consideration.

KNOWLEDGE CHECK: MEETING KEOWN CORPORATION'S SHORT-TERM FINANCING NEEDS



1. Keown Corporation has accounts payable of CAD2 million with terms of 2/10, net 30 and accounts receivable of CAD2 million. In addition, the company holds CAD5 million in marketable securities. Keown has a short-term need of CAD200,000 to meet payroll. Which of the following choices makes the most sense for raising the CAD200,000?

- A. The company should issue long-term debt.
- B. The company should issue common stock.
- C. The company should delay paying accounts payable and forgo the 2% discount.
- D. The company should sell accounts receivable at a 10% discount.
- E. The company should sell marketable securities at a 0.5% brokerage cost (ignore capital gains tax).

Solution:

E is correct.

The options for raising CAD200,000 are summarized in this table.

Source of Funds	Action	Liquidation Cost	
		%	CAD
C. Accounts payable (2/10, net 30)	Delay CAD200,000 in payment and forgo 2% discount	2.0	4,000
D. Accounts receivable	Sell CAD222,222 in value at 10% discount to raise CAD200,000	10.0	22,222
E. Marketable securities	Sell CAD200,000 in value	0.5	1,000

Choosing C involves forgoing a 2% discount, which on CAD200,000 amounts to a cost of CAD4,000. To net CAD200,000 using option D, the company would have to sell CAD222,222 of accounts receivable at a cost of CAD22,222. E appears to be the best choice. Marketable securities are liquid and can be easily sold for market value, less the relatively minor brokerage cost of CAD1,000.

QUESTION SET

1. Classify each of the following in terms of approaches to working capital management:

	Conservative	Aggressive
Greater level of inventory relative to sales		
Greater reliance on long-term financing		
Greater level of cash on hand		
Greater level of marketable securities		
Greater reliance on short-term bank loans		

Solution:

	Conservative	Aggressive
Greater level of inventory relative to sales	✓	
Greater reliance on long-term financing	✓	
Greater level of cash on hand	✓	
Greater level of marketable securities	✓	
Greater reliance on short-term bank loans		✓

2. A company has USD30 million of accounts payable, for which it could delay payment to day 14, forgoing the 2% discount it would receive for paying within ten days. The liquidation cost in millions of USD is closest to:

- A. 0.6.
B. 6.1.
C. 8.4.

Solution:

A is correct. The liquidation cost is the forgone 2% discount applied to the USD30 million value of the accounts payable.

$$\text{Liquidation cost} = \text{USD } 30 \text{ million} \times 0.02 = \text{USD } 0.6 \text{ million}$$

B and C are incorrect, because they represent effective annual rates of the forgone interest applied to the value of the accounts payable.

3. A company changed the credit terms it offers its customers from 1/10, net 30 to 1/15, net 30. The most likely effect of this change is:

- A. an increase in accounts receivable.
B. no change in accounts receivable.

- C.** a decrease in accounts receivable.

Solution:

A is correct. The company extended the discount period by 5 days and did not change the discount amount as a percentage of the sale price (1%). More generous credit terms for its customers will likely increase accounts receivable, because customers will take longer to pay even if they take the discount. In addition, the more attractive credit terms may result in increased accounts receivable due to increased sales.

B and C are incorrect, because a more generous discount period will result in increased accounts receivable as customers will take longer to pay if they take advantage of the discount.

4. Changing its accounts receivable policy to extend credit to customers with lower creditworthiness will most likely result in:

- A.** a pull on liquidity.
B. a drag on liquidity.
C. no effect on liquidity.

Solution:

B is correct. By extending credit to customers with lower creditworthiness, the company is likely to experience more delinquent or uncollectible accounts and an increase in days sales outstanding, resulting in a drag on liquidity.

A is incorrect, because a pull on liquidity would result from an acceleration of cash outflows. In this case, the change to the company's credit policy has the effect of slowing cash inflows.

C is incorrect, because the change in the company's accounts receivable policy would likely increase its working capital needs due to having higher accounts receivable.

5. The Lucor Corporation is seeking to raise liquidity and is evaluating two potential actions.

Option 1 Selling accounts receivable to a financial intermediary at a 5% discount off their carrying value

Option 2 Accelerating payments to suppliers to receive a 5% discount

Which of the options would achieve Lucor's objective?

- A.** Option 1
B. Option 2
C. Neither, because they both incur liquidation costs

Solution:

A is correct. Option 1 would increase liquidity by converting a less liquid asset (accounts receivable) into cash immediately, albeit at a cost.

B is incorrect, because Option 2 would decrease liquidity by accelerating cash outflows.

C is incorrect, because Option 2 would decrease liquidity by accelerating cash outflows and would not incur liquidation costs.

PRACTICE PROBLEMS

1. An issuer changing its credit terms for customers from 2/10, net 30 to 2/10, net 40 will most likely experience:
 - A. a pull on its liquidity.
 - B. a drag on its liquidity.
 - C. no change in its liquidity.
2. Which of the following will most likely *decrease* an issuer's cash conversion cycle? An increase in its days:
 - A. sales outstanding.
 - B. of inventory on hand.
 - C. payable outstanding.
3. An analyst gathers balance sheet information for the most recent fiscal year for three issuers.

	Issuer A	Issuer B	Issuer C
Cash	100	120	50
Marketable securities	20	10	20
Accounts receivable	300	300	200
Inventory	500	600	300
Prepaid expenses	50	0	10
Accounts payable	400	500	300
Accrued expenses	40	20	0

Which issuer is most liquid based on the quick ratio?

- A. Issuer A
 - B. Issuer B
 - C. Issuer C
4. An analyst is evaluating an issuer's liquidity and calculates a negative cash conversion cycle for the issuer in the most recent fiscal year. This result is:
 - A. not feasible.
 - B. possible, because the issuer has sufficient cash and marketable securities on hand to support short-term needs.
 - C. possible, because the investment in inventory is returned quickly and the issuer takes advantage of vendor financing.
 5. An issuer eliminated the prompt-payment discount it had offered to customers. This action most likely will:
 - A. increase the issuer's liquidity.

- B.** decrease the issuer's liquidity.
- C.** not affect the issuer's liquidity.

SOLUTIONS

- B is correct. By extending the net period, the issuer will likely see its accounts receivable increase, lengthening its cash conversion cycle and producing a drag on its liquidity.

A is incorrect, because the change will slow payments from customers (inflows) rather than pull on liquidity in terms of outflows.

C is incorrect, because extending the net period will slow payments from customers and produce a drag on liquidity.
- C is correct. Increasing days payable outstanding would reduce the cash conversion cycle, because payments to suppliers are delayed. Days payable outstanding is subtracted from the sum of days sales outstanding and days of inventory on hand to compute the cash conversion cycle.

A is incorrect, because an increase in days sales outstanding will increase the issuer's cash conversion cycle.

B is incorrect, because an increase in days of inventory on hand will increase the issuer's cash conversion cycle.
- A is correct. The quick ratio is defined as:

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Short-term marketable instruments} + \text{Receivables}}{\text{Current liabilities}}$$

The quick ratio for each issuer is:

Issuer A quick ratio = $\frac{100 + 20 + 300}{400 + 40} = \frac{420}{440} = 0.9545$

Issuer B quick ratio = $\frac{120 + 10 + 300}{500 + 20} = \frac{430}{520} = 0.8269$

Issuer C quick ratio = $\frac{50 + 20 + 200}{300 + 0} = \frac{270}{300} = 0.9000$
- C is correct. If days of inventory on hand is low, the accounts receivable collection period is short, and the issuer takes advantage of its vendors' financing, a negative cash conversion cycle is a possible result.

A is incorrect, because issuers may have a negative cash conversion cycle if days payable outstanding is larger than the sum of days of inventory on hand and days sales outstanding.

B is incorrect, because the amount of cash and marketable securities on hand does not affect the company's cash conversion cycle.
- B is correct, because the elimination of the discount will likely result in customers paying later as there is no incentive to pay early without the discount. With customers paying later, this action becomes a drag on liquidity.

A and C are incorrect, because customers likely paying later will reduce the issuer's liquidity.

LEARNING MODULE

5

Capital Investments and Capital Allocation

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe types of capital investments
☐	describe the capital allocation process, calculate net present value (NPV), internal rate of return (IRR), and return on invested capital (ROIC), and contrast their use in capital allocation
☐	describe principles of capital allocation and common capital allocation pitfalls
☐	describe types of real options relevant to capital investments

INTRODUCTION

1

The previous learning module described issuers' *short-term* investments and financing activities. In this module and the next, we turn our attention to issuers' *long-term* investment and financing activities. First, we explore the various forms of capital investment and their purposes. We then discuss the investment decision-making process and compare analytical approaches employed in that process. In the third lesson, we describe principles of capital allocation and common pitfalls. While the goals of both capital allocation and estimating expected investment returns are to select the best choice among investment alternatives, a firm's decision today may influence future investment decisions, resulting in so-called real options, which are discussed in the final lesson.

LEARNING MODULE OVERVIEW



- Companies make capital investments to maintain or expand operations. Capital investments can be grouped into four categories based on their risk and return characteristics: (1) going concern projects, (2) regulatory/compliance projects, (3) expansion projects, and (4) other.
- Capital allocation is a process undertaken by issuers' management and board for evaluating investment opportunities based on their expected contribution to shareholder value, as well as other considerations, such as environmental, social, and governance (ESG) factors. Although

some projects might look profitable on an accounting or standalone basis, they might be uneconomical compared to alternatives or from an overall strategic perspective. Such projects should not be pursued, and capital should instead be returned to shareholders.

- Net present value (NPV) and internal rate of return (IRR) are two tools used to evaluate individual investment projects. NPV estimates the increase in firm value from a project, while IRR is an estimate of the rate of return on a project, subject to certain assumptions, which can be compared to a hurdle rate.
- Unlike NPV and IRR, return on invested capital (ROIC) is a company-wide measure and can be calculated using data available to independent analysts. ROIC is the rate of return an issuer earns over a period across all investments and can be compared to an investor's required rate of return. Like NPV and IRR, ROIC is subject to limitations and assumptions.
- Before investment projects are appraised on a quantitative basis, they should be modeled in accordance with certain principles, including measurement of cash flows on an after-tax basis, avoiding double counting, and including a project's impact on the rest of the firm. Impacts can be positive, such as cost savings, or negative, such as the loss of sales from existing products.
- Apart from deviations from these principles, capital allocation is additionally prone to behavioral biases and cognitive errors. These pitfalls can be detected by a thorough analysis of a company's financials on a historical and comparative basis, as well as an examination of corporate governance and management remuneration policies.
- Real options are like financial options in that they provide a right, not an obligation, for management to alter different aspects of capital projects in the future. Those aspects include timing and size of a project, as well as flexibility with regard to future pricing policies or operating capacity.
- The most common approach to evaluating projects with real options is to compare a project's NPV before and after inclusion of an option's value less the option's cost. More advanced methods include decision trees and option pricing models, which require assumptions about the probability of future events.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

1. The following list contains either an example or an attribute of a capital investment project. Assign each item to either *maintenance* or *growth*.
 - Acquisition
 - Expand business scope
 - Research and development
 - Replace outdated facilities
 - High-risk investment and uncertainty

- Limited downside risk and uncertainty
- Needed to meet safety, compliance, regulatory standards

Maintenance**Growth****Solution:****Maintenance****Growth**

Replace outdated facilities

Acquisition

Needed to meet safety, compliance,
regulatory standards

Expand business scope

Limited downside risk and uncertainty

Research and development

High-risk investment and uncertainty

2. When calculating IRR, the interim cash flows are assumed to be reinvested and earn a rate of return rate that is:

- A. lower than IRR.
- B. the same as IRR.
- C. higher than IRR.

Solution:

B is correct. An important assumption of IRR is that it represents only the (geometric) rate of return on the investment if interim cash flows are reinvested at the IRR.

A is incorrect because if reinvestment rates are lower compared to IRR, the rate of return on the investment will be lower than the IRR.

C is incorrect because if reinvestment rates are higher compared to IRR, the rate of return on the investment will be higher than the IRR.

3. Complete the following sentences by filling in the blanks using the terms provided.

When calculating ROIC, an independent analyst should add _____ and _____ to calculating average invested capital. ROIC, _____ project NPV and IRR, can be calculated using data available to independent investment analysts.

like

unlike

equity

short-term assets

long-term assets

long-term liabilities

Solution:

When calculating ROIC, an independent analyst should add equity and long-term liabilities to calculate average invested capital. ROIC, unlike project NPV and IRR, can be calculated using data available to independent investment analysts.

4. Explain why capital allocation decisions should *not* be based on accounting measures such as earnings per share (EPS).

Solution:

Capital investments with a positive NPV can reduce rather than increase accounting measures in the near term, while cost cutting and share buybacks, in contrast, may have a positive effect on such measures. Basing investment decisions on short-term accounting numbers can lead a company to choose investments that are not in the long-run interests of its shareholders. Additionally, capital allocation should consider opportunity costs, such as by using a required rate of return for calculating NPV and an appropriate hurdle rate for an IRR. Accounting profits do not consider opportunity costs.

5. The annual report of company XYZ contains the following disclosures:

Disclosure 1: "XYZ's management compensation is based on exceeding a target EPS growth rate."

Disclosure 2: "XYZ's management does not change the required rate of return when evaluating capital projects based on whether they are financed by internal or external sources."

Disclosure 3: "When evaluating investment projects, XYZ prepares cash-flow projections based on inflation-adjusted cash flows and discounts them using real rates."

Which of the disclosed policies does *not* conform to best practices regarding capital allocation?

- A. Disclosure 1
- B. Disclosure 2
- C. Disclosure 3

Solution:

A is correct. Positive-NPV investment projects can reduce, rather than increase, EPS in the near term, even though they increase shareholder value. Management compensation should incorporate a longer-term perspective and a measure that better considers required rates of return, such as ROIC. B is incorrect because internally generated capital, such as cash flow from operations, is equity financing and it could be returned to equity investors as a dividend. Regardless of the financing source, management should use appropriate risk-adjusted required rates of return to evaluate capital investments.

C is incorrect because companies may perform analysis in either nominal or real terms, but the approach to cash flows and the discount rate should be consistent. That is, nominal cash flows should be discounted at a nominal discount rate, and real (inflation-adjusted) cash flows should be discounted at a real rate.

6. Explain what real options are and how they influence company value.

Solution:

Real options are similar to financial options, except that they deal with real, instead of financial, assets. Real options grant companies the right to make a decision (but do not impose an obligation) in the future that alters the value of capital investment decisions made today. Real options, by providing future decision-making flexibility to companies, can be an important piece of the value in many capital investments.

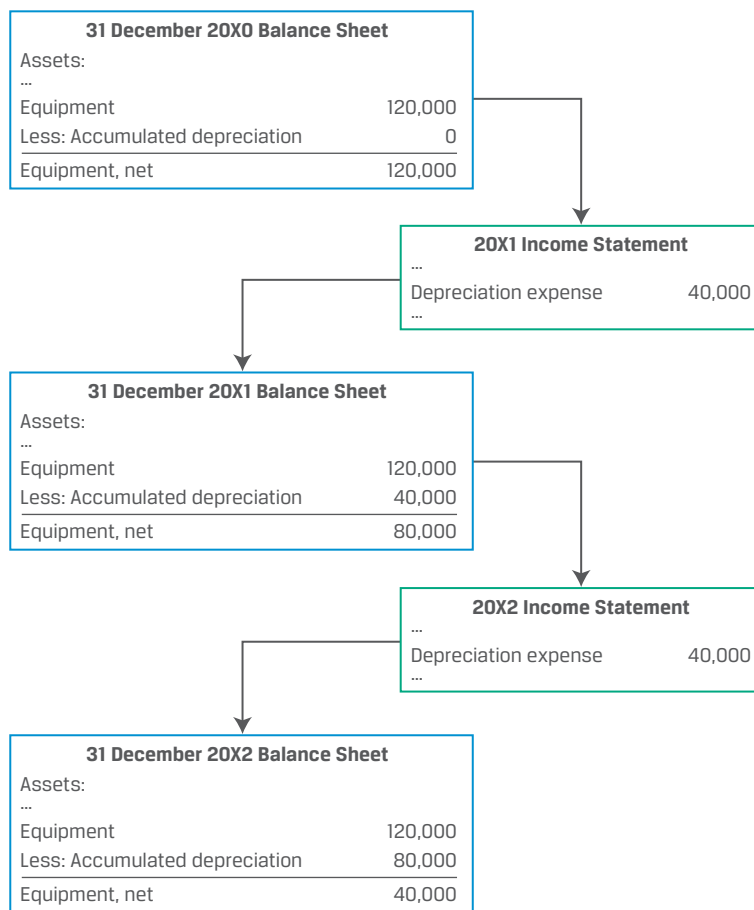
CAPITAL INVESTMENTS

2

☐ describe types of capital investments

Capital investments, also referred to as *capital projects*, are investments with a life of one year or longer, which usually appear on the balance sheet as long-term assets. Like most assets, capital investments are initially recorded at cost. The expenditure is not recorded on the income statement; rather, a portion of the cost is recorded on the income statement periodically as a non-cash **depreciation** or **amortization** expense over the asset's useful life. The result is that capital spending is "smoothed" over time and aligned with the inflow of benefits from the investment. On the statement of cash flows, cash capital spending is simply reported as incurred.

In subsequent periods, capital investment assets are presented on the balance sheet on a *net* basis: cost less accumulated depreciation or amortization. As depreciation or amortization is recorded over time and accumulates, this net value declines to zero or a salvage value. The process is illustrated in Exhibit 1 and will be covered in greater detail later in the curriculum.

Exhibit 1: Depreciation/Amortization of a Long-Term Asset

A firm's capital investment and allocation process are central to its success and therefore important for analysts to understand. Capital investments describe a company's prospects best, providing insight into both the quality of management decisions and how the company creates value. Note that capital investments are not limited to property, equipment, and other tangible assets; increasingly, capital investments are in the form of digital capabilities and other intangible assets. Regardless of the nature of the asset, the principles in this learning module apply because we are focused on cash flows.

Four categories of capital investments and their potential uses are summarized in Exhibit 2. These investments usually link to the business model of the firm and reflect its strategic and competitive environment.

Exhibit 2: Types of Capital Projects

Maintain Business	Grow Business
Going Concern (Maintenance) ▪ Continue current operations ▪ Improve efficiency ▪ Risk management	Expansion of Existing Business ▪ Expand business size ▪ Expand business scope ▪ Research and development and acquisitions within core business ▪ Low to moderate risk
Regulatory/Compliance ▪ Usually imposed by a third party, laws, etc. ▪ Needed to meet safety, compliance, regulatory or supervisory standards	New Lines of Business and Other ▪ Research and development, investments, and acquisitions outside the firm's current business ▪ Often high risk

Going Concern Projects

Going concern projects, often known as **maintenance capital expenditures**, are investments to continue the company's current operations and maintain the existing size of the business. Common going concern projects include replacing assets nearing the end of their useful life, maintaining IT hardware and software, and continuous improvements of existing facilities. For example, a company might replace data center cooling units with newer, more efficient alternatives.

These maintenance projects are relatively easy for management to evaluate since they usually involve the replication of existing business operations. Projects aimed at improving efficiencies typically involve comparing the upfront cost to the expected periodic savings over time in the context of current operations. Typically, these projects are lower risk.

To fund these projects, managers (and debt investors who provide the financing) usually seek to match the term of incremental financing with the lifespan of new assets. For example, a utility company may issue a 30-year bond to finance replacement power generation equipment with an expected useful life of 30 years. This so-called **match funding** approach reduces financing risk, because funding long-term assets with shorter debt obligations introduces rollover risk, or uncertain financing cost or availability during the project before the capital investment reaches the end of its useful life. Similarly, a company that borrows for longer than necessary may either pay a higher long-term rate of interest or face the cost of buying back debt in the future that is no longer needed.

Issuers are not required to disclose the amount of maintenance capital expenditures or the composition of total capital expenditures generally. Analysts often estimate that annual maintenance capital expenditure is equal to the amount of depreciation and amortization expense reported on the income statement. The accuracy of this estimate depends on how closely the expected useful life of assets approximates actual useful life and whether the historical cost of an asset approximates its replacement cost; both assumptions are likely to be more accurate for shorter-lived assets.

Regulatory Compliance Projects

Unlike projects based on management discretion, regulatory compliance projects are required to meet rules and standards. For example, such projects may be driven by a new law to reduce pollution or financial regulations requiring banks to monitor and report transactions and balances to regulators.

Regulatory compliance projects often increase a firm's expenses with no added revenue but are required to avoid fines and/or to continue operations. However, industry incumbents may find that such rules and standards serve as a barrier to industry entry and therefore increase or protect their profitability. Also, when firms work directly with regulators to develop these new standards, their timing and impact may be tailored to best suit an industry's ability to adapt while continuing operations. Firms with greater financial flexibility may consider early adoption of new rules to reduce business uncertainty going forward and gain a competitive edge versus their peers. Moreover, such investments can attract new customers and are often considered to create a strategic advantage.

As standards evolve, firms must decide whether the returns on an underlying business remain attractive once additional regulatory costs are imposed. In some cases, firms may be able to pass some or all of the additional regulatory costs from these projects on to end users in the form of higher prices. In other cases, a firm may decide that a business no longer meets its minimum return requirement (once the costs of such projects are included) and it would be better off winding down or ceasing certain affected operations altogether.

EXAMPLE 1

Complying with Anti-Money-Laundering Regulations

Danske Bank A/S (“Danske”), the largest financial institution in Denmark, is subject to a large anti-money-laundering investigation after a report from a whistle blower and audit letters from Group Internal Audit. Danske acknowledged in a press release that *“major deficiencies in controls and governance made it possible to use Danske Bank's branch in Estonia for criminal activities, such as money laundering.”*

The examination of Danske's anti-money-laundering policies resulted in the resignation of its CEO, the closure of the Estonian branch, and the arrests of multiple employees. Danske is also expected to pay fines of up to several billion dollars to financial regulators in the United States, Denmark, and other European countries. The scandal not only had an impact on Danske but also resulted in increasing penalties for money laundering in Denmark.

While regulatory compliance projects can be costly, they can prevent scandals and losses from fines and legal proceedings that damage firms' reputations.

Businesses seeking to grow often engage in capital projects to increase the *scale* of existing business activities, expand their *scope* to new areas of operation, or enter new areas. These expansion projects typically involve greater uncertainty, time, and amounts of capital than going concern or regulatory compliance projects.

Expansion of Existing Business

Capital projects aimed at increasing the size of a firm's existing operations may introduce execution risks, such as sourcing additional inputs, addressing unforeseen production and distribution bottlenecks, or failing to budget for the cost of acquiring new customers. These risks are highest among firms in an early phase without established

operations whose expansion projects are therefore usually largely financed by equity. More established firms also spend heavily on expansion projects. For example, pharmaceutical and energy exploration companies often invest over 10% of annual revenues in pursuit of new medications and energy reserves, respectively. Similarly, technology companies typically invest heavily in expansion projects initially to accelerate product development cycles, maintain competitiveness, acquire customers and clients, and stay ahead of rivals. Established firms with an existing track record of successful expansion are more often able to use debt financing for such capital projects given investor perception of lower associated risk.

Capital investments are also usually necessary if an established firm decides to extend its existing operations to adjacent products and services or expand to new regions or markets. The expansion of business scope may take advantage of existing capabilities to meet the needs of a different customer base. Unforeseen risks related to increasing scope include the added complexity of managing multiple business lines and facing new competitors. Investors and analysts often look to a firm's competitive position and past performance by peers in executing similar strategies when gauging the likelihood of success.

EXAMPLE 2

Sony Grows Gaming Business

Sony Interactive Entertainment ("SIE") is a global, leading video game and digital entertainment company owned by Japanese multinational conglomerate Sony. SIE conducts the research and development, production, and sales of both hardware and software for the PlayStation console.

In January 2022, SIE announced it would acquire Bungie Inc. ("Bungie") for \$3.6 billion. Bungie is a US-based independent videogame developer and long-time partner of SIE that has created some of the videogame industry's most highly acclaimed franchises, including Halo, Myth, and Destiny.

In the press release, SIE summarized how the acquisition would expand its business: "This acquisition will give SIE access to Bungie's world-class approach to live game services and technology expertise, furthering SIE's vision to reach billions of players."

New Lines of Business and Other Projects

A firm's management may decide to invest in an activity completely outside or only minimally related to its existing business. Usually seen as a special situation offering unusual growth, investment, or innovation opportunities for a company's business or business model, these projects are likely to be the riskiest capital investments.

Either these projects will have characteristics of a startup, such as investing capital to explore a new technology or a business idea/model for sources of new business growth, or the company will acquire a firm in a new industry or sector. Important risks include the unforeseen challenges of an unfamiliar business and the risk of overpaying.

EXAMPLE 3

Kirin Enters New Market

Kirin Holding ("Kirin") is an integrated beverage producer and the second largest brewer in Japan. Kirin's top brands include both alcoholic beverages, such as Kirin Ichiban and Honkirin, and soft drinks, such as Kirin Gogo-no-Kocha and Nama-cha.

In September 2019, Kirin invested ¥129 billion to become a top shareholder of Fanc! Corp. (“Fanc!”), a Japanese cosmetics and dietary supplement maker. Fanc! has more than 25 years of experience as a pioneer in the supplement market and is a market leader in foods with functional claims. Both companies want to combine their research and development capabilities with their strong brands to offer a wide range of products.

Analysts should carefully examine issuers’ overall level and trend of expansion capital investment, as well as the segment and market if disclosed, to analyze growth prospects, management priorities, and the rates of return on investment relative to alternatives. The level and trend of expansion capital spending may be estimated by subtracting maintenance (often estimated using depreciation and amortization expense) from total capital expenditures.

QUESTION SET



1. Match the following examples of capital projects with type of the project.

- Project 1: An office equipment producer decides to develop a new line of computer peripherals intended for gamers.
- Project 2: A tire producer decides to invest in solar panel production to benefit from government subsidies.
- Project 3: A global bank migrates its on-site data storage to cloud computing data storage to improve its cost efficiency.
- Project 4: A property management company undertakes a new capital project intended to install an advanced ventilation system in all its office buildings to meet stricter air pollution regulations.

Project Type

Capital Project

Expansion of existing business

Going concern/maintenance

Regulatory or compliance

New lines of business and other

Solution:

Project Type

Capital Project

Expansion of existing business

Project 1, because it aims to increase the size of a firm’s existing operations and acquire new customers

Going concern/maintenance

Project 3, which allows the bank to continue its current operations using more efficient technology

Regulatory or compliance

Project 4, because unlike projects based on management discretion, this project is to comply with air pollution regulations.

New lines of business and other

Project 2, which is an investment into a new market not related to the company’s existing business

2. It is true that the capital allocation process:

- A. involves the use of significant proprietary, non-public information about a company.
- B. aims at identifying projects with the highest absolute non-risk-adjusted rate of returns.
- C. uses less information compared to the process used to construct investment management portfolios.

Solution:

A is correct. The capital allocation process is the process used by a firm's management and board to make capital investment based on both internal, non-public *and* public information. The process is substantially similar to those used by investors and analysts constructing investment management portfolios but occurs at a more granular level of detail and more in "real time" because insiders do not need to wait for quarterly earnings reports. B is incorrect because the capital allocation process is used by a firm's management to deliver superior risk-adjusted returns, when compared to similarly risky investments.

C is incorrect because the capital allocation process is more granular compared to the process used to construct investment management portfolios. The capital allocation process focuses on identifying profitable projects and utilizes proprietary information. The process used to construct investment portfolios involves public information and non-material, non-public information, often at the company and segment level.

3. What type of capital allocation project will *most likely* be implemented even if it has a negative estimated NPV?

- A. New lines of business and other
- B. Expansion of existing business
- C. Regulatory or compliance

Solution:

C is correct. Regulatory compliance projects are required by third parties, such as government regulatory bodies, to meet rules and standards and to avoid fines or other legal consequences.

A and B are incorrect because new lines of business and other as well as expansion of existing business projects are done at management's discretion and would generally not be pursued if they were estimated to have a negative NPV.

CAPITAL ALLOCATION

3



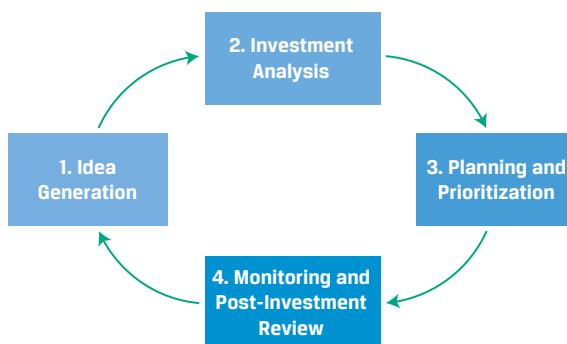
describe the capital allocation process, calculate net present value (NPV), internal rate of return (IRR), and return on invested capital (ROIC), and contrast their use in capital allocation

Capital allocation is the process used by a firm's management and board to make capital investment and return decisions. Management seeks to deliver risk-adjusted returns greater than what investors could earn on similarly risky investments elsewhere.

The process is substantially similar to those used by investors and analysts constructing investment management portfolios but occurs at a more granular level of detail. Rather than only investing in entire companies, issuers invest in projects and utilize significant proprietary, non-public information.

Investors and analysts must judge whether an issuer will manage capital wisely over the long term. To make that judgment, analysts should evaluate the issuer's capital allocation process and its adherence to first principles and, most importantly, assess the issuer's historical track record of capital allocation. The generic steps in the capital allocation process are shown in Exhibit 3.

Exhibit 3: Steps in the Capital Allocation Process



- *Idea generation:* While ideas may originate from anywhere, it is important that management has a strong understanding of the competitive environment that the prospective investment is situated in, as well as the firm's current operations, capabilities, and competitive position. Often, ideas come from managers engaged in the business and involve expanding scale and scope of existing activities or adjacent businesses. Executives may also engage external consultants for advice on idea generation. As will be discussed later, capital spending tends to be highly correlated from year to year, indicating that prior-period ideas and plans weigh heavily.
- *Investment analysis:* Following the generation of investment ideas, managers forecast the amount, timing, duration, and volatility of an investment's expected cash flows to estimate whether the investment is a wise use of capital.
- *Planning and prioritization:* Management selects and prioritizes profitable investment opportunities that, when considered together, are the most value enhancing on a risk-adjusted return basis. Only investment candidates estimated to generate returns greater than investors' opportunity cost (the returns they could earn elsewhere on similarly risky endeavors) should be pursued. Additionally, some projects that appear attractive in isolation may be less desirable when considered in the context of existing operations, other proposed projects, or constraints on financing.

When value-creative investment opportunities are exhausted, managers should return any remaining capital to shareholders. In this way, shareholders can redeploy that capital elsewhere to earn their required rate of return.

- *Monitoring and post-investment review:* This step involves monitoring the performance of the investment and related activities against projections and, often, making adjustments, such as increasing or decreasing investment levels (which will be discussed later as real options). This step is important for several reasons. First, it helps validate assumptions made in the capital allocation process, revealing systematic errors, such as overly optimistic forecasts. Second, it helps enforce discipline in business operations by focusing management attention on bringing performance into alignment with projections. Finally, it may produce ideas for future investments. Managers should seek to invest in profitable areas and scale down or dispose of assets in areas that generate suboptimal returns or may have greater value to other firms.

Two of the most widely used analytical tools in the investment analysis step are **net present value (NPV)** and **internal rate of return (IRR)**. These are applications of time-value-of-money concepts. While an independent investment analyst does not have access to the project-by-project information used by management in these calculations, an analyst should understand the rationale behind them, their strengths, and their limitations in practice (also, these tools are used elsewhere in investment management, which will be covered later in the curriculum). Analysts have access to highly aggregated consolidated financial statements, which they can use to calculate and analyze **return on invested capital (ROIC)**, a useful *aggregate*, rather than *project*, return measure.

Net Present Value (NPV)

The NPV of an investment is the present value (in currency terms) of expected future cash inflows less the investment's costs (or cash *outflows*), as shown in Exhibit 4.

Exhibit 4: Net Present Value of a Capital Investment

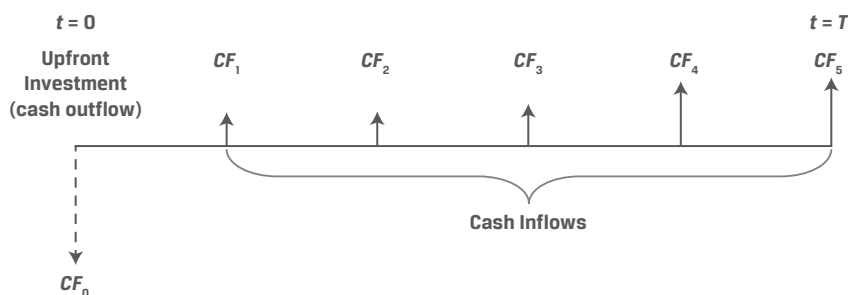


Exhibit 4 shows the simple case where a single investment ($CF_0 < 0$) occurs at inception followed by cash inflows. We may solve for the NPV using Equation 1:

$$\text{NPV} = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_T}{(1+r)^T} \quad (1)$$

$$\text{NPV} = \sum_{t=0}^T \frac{CF_t}{(1+r)^t}$$

where

CF_t = After-tax cash flow at time t

r = Required rate of return—the rate of return that a corporate issuer's investors could earn on a similarly risky investment

The calculation is illustrated in the following example.

EXAMPLE 4

Gerhardt Corporation NPV

1. Assume that Gerhardt Corporation is considering a capital investment of €50 million today that is expected to return after-tax cash flows of €16 million per year for the next four years plus another €20 million in Year 5. If the required rate of return is 10%, what is the NPV of this investment?

Solution:

Using Equation 1, we may solve for the NPV as follows:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_T}{(1+r)^T}$$

$$NPV = -50 + \frac{16}{(1+0.10)^1} + \frac{16}{(1+0.10)^2} + \frac{16}{(1+0.10)^3} + \frac{16}{(1+0.10)^4} + \frac{20}{(1+0.10)^5}$$

$$NPV = -50 + 63.136 = 13.136$$

Since this investment may be acquired today at a cost of €50 million, the company exchanges €50 million today for an investment worth €63.136 million. The investment increases the present value of the firm's wealth by a net amount of €13.136 million.

This can also be solved in Microsoft Excel or Google Sheets using the NPV function:

=NPV(rate,value1,value2,...)

where

rate = Required rate of return

value(s) = After-tax cash flows

Note that the NPV function uses $t = 1$ for the first cash flow, not $t = 0$, and assumes cash flows are evenly spaced. Therefore, cash flows at $t = 0$ (in this case, -50) need to be subtracted or added outside the function. The proper argument here is

$$= NPV(0.10, 16, 16, 16, 16, 20) - 50$$

$$= 13.136$$

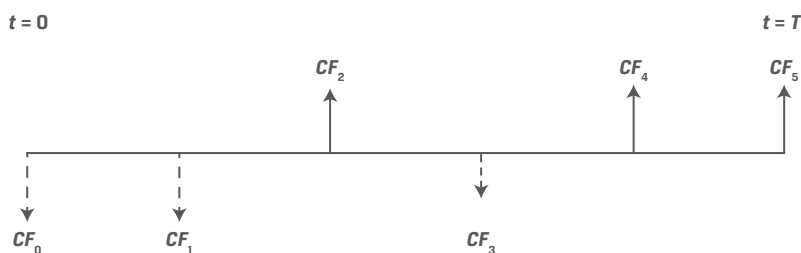
Because the NPV is the amount by which investors' wealth increases from an investment, the NPV decision rule is as follows:

Invest if	NPV ≥ 0 .
Do not invest if	NPV < 0 .

Positive-NPV investments increase the wealth of the shareholders, while a negative NPV reduces wealth. In the rare event that NPV is zero, a project could be accepted because it meets the required rate of return. However, because NPV analysis relies on estimated future cash flows, a zero-NPV project leaves no room for error. While the decision rule is straightforward, NPV is usually just one factor in capital allocation. There may be competing projects, intangible considerations, and so on, that factor into the decision. Therefore, $NPV \geq 0$ can be viewed as a *necessary* but not *sufficient* condition for making an investment.

Many investments have unconventional cash flow patterns in which outflows may occur not only at inception but also on future dates, as in Exhibit 5. An example of this is an investment in additional capacity at a later stage.

Exhibit 5: Unconventional Cash Flow Patterns



Analysis of these types of investments is best handled using spreadsheet software, such as Microsoft Excel and Google Sheets, manually, or using the XNPV function, which, unlike the NPV function, does *not* assume evenly spaced periods and allows the user to specify the timing of cash flows. This concept is illustrated in the following example.

EXAMPLE 5

Gerhardt Corporation NPV II

Assume that Gerhardt Corporation is considering a capital investment of €50 million today with the following estimated cash flow schedule over the next five years (all amounts in millions of euros).

t	0	1	1.5	2	3	4	5
Cash flow	-50	10	-5	13	16	19	23

1. If the required rate of return is 10%, what is the NPV of this investment and should Gerhardt make the investment?

Solution:

Using Equation 1, we may solve for the NPV as follows:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_T}{(1+r)^T}$$

$$NPV = -50 + \frac{10}{(1+0.10)^1} + \frac{-5}{(1+0.10)^{1.5}} + \frac{13}{(1+0.10)^2} + \frac{16}{(1+0.10)^3} + \frac{19}{(1+0.10)^4} + \frac{23}{(1+0.10)^5}$$

$$NPV = 4.78.$$

Since the $NPV \geq 0$, Gerhardt should make the investment.

This problem can also be solved in Microsoft Excel or Google Sheets using the XNPV function. The XNPV function syntax is as follows:

=XNPV(rate,values,dates)

where

rate = Required rate of return

values = After-tax cash flows at each date

dates = Date of each after-tax cash flow (for a problem like this without exact dates, the dates are arbitrary; what matters is that they are accurately spaced)

The function is most clearly specified by referencing cash flow and date arrays that are aligned on a spreadsheet, as shown here:

	A	B	C	D	E	F	G	H	I
1	Cash flow	-50	10	-5	13	16	19	23	
2	Date	1/1/2000	12/31/2000	7/1/2001	12/31/2001	12/31/2002	12/31/2003	12/31/2004	
3	Required rate of return	10%							
4	NPV	=XNPV(B3:B1:H1,H2:H2)							

Internal Rate of Return

The **internal rate of return (IRR)** is the discount rate that makes the net present value of an investment equal to zero, as shown in Equation 2:

$$\sum_{t=0}^T \frac{CF_t}{(1+IRR)^t} = 0. \quad (2)$$

Note the similarity of the IRR calculation to Equation 1, which includes r (the required rate of return) in the denominator instead of IRR .

EXAMPLE 6

Gerhardt Corporation IRR

1. Assume that Gerhardt Corporation is considering a capital investment of €50 million today that is expected to return after-tax cash flows of €16 million per year for the next four years plus another €20 million in Year 5. What is the IRR of this investment?

Solution:

Recall from Equation 1 that the NPV is

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_T}{(1+r)^T}$$

The IRR is the discount rate, r , that makes the NPV equal to zero. In other words,

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_T}{(1+r)^T}$$

$$0 = -50 + \frac{16}{(1+IRR)^1} + \frac{16}{(1+IRR)^2} + \frac{16}{(1+IRR)^3} + \frac{16}{(1+IRR)^4} + \frac{20}{(1+IRR)^5}$$

Besides trial and error, the IRR function in Microsoft Excel and Google Sheets is a straightforward approach to solving this problem. The IRR function syntax is

`=IRR(values,[guess])`

where

values = After-tax cash flows

[guess] = An optional user-specified guess for the IRR (the default is 10%)

Importantly, like the NPV function, the IRR function assumes that cash flows are received or paid at the end of period and that each period is evenly spaced. Unlike the NPV function, it does not assume that the first cash flow is at $t = 1$, so the argument here is simply

`=IRR(-50, 16, 16, 16, 16, 20)`

`= 0.1952, or 19.52%.`

The IRR decision rule is to invest if the IRR *exceeds* the required rate of return (r) for a capital investment:

Invest if	$IRR \geq r.$
Do not invest if	$IRR < r.$

For this reason, the required rate of return is often referred to as the **hurdle rate**. If the IRR is equal to r , the project is *theoretically* acceptable because it meets the required return with an NPV of zero. Since the IRR of 19.52% in our example exceeds the hurdle rate of 10%, Gerhardt should invest.

An important attribute of IRR is that it will only equal an investor's (geometric) rate of return on an investment if interim cash flows are reinvested at the IRR; if reinvestment rates are in fact lower, the rate of return on the investment will be lower than the IRR and vice versa. The NPV calculation instead assumes interim cash flows are reinvested at r , the required rate of return, which is often more economically realistic. Reinvestment rates and the implications therein will be explored in depth later in the curriculum in fixed-income lessons.

For an investment for which the assumptions of end-of-period, evenly spaced cash flows are inappropriate, the XIRR function in Microsoft Excel and Google Sheets is the proper tool, as in the following example.

EXAMPLE 7**Gerhardt Corporation IRR III**

1. Assume that Gerhardt Corporation is considering a capital investment of €50 million today with the following estimated cash flow schedule over the next five years (all amounts in millions of euros).

<i>t</i>	0	1	2	2.5	3	4	5
Cash flow	-50	0	1	3	16	20	25

What is the IRR of this investment, and should Gerhardt make the investment if its required rate of return is 10%?

Solution:

This problem can be solved in Microsoft Excel or Google Sheets using the XIRR function. The XIRR function syntax is as follows:

`=XIRR(values,dates,[guess])`

where

values = After-tax cash flows at each date

dates = Date of each after-tax cash flow (for a problem like this without exact dates, the dates are arbitrary; what matters is that they are accurately spaced)

[guess] = An optional user-specified guess for the IRR (the default is 10%)

The function is most clearly specified by referencing cash flow and date arrays that are aligned on a spreadsheet, as shown here:

	A	B	C	D	E	F	G	H	I
1	Cash flow	-50	0	1	3	16	20	25	
2	Date	1/1/2000	12/31/2000	12/21/2001	7/1/2002	12/31/2002	12/21/2003	12/21/2004	
3	IRR	=XIRR(B1:H1,B2:H2)							

The IRR is 6.76%, which is below Gerhardt's required rate of return of 10%, so it should not invest in this project.

An important limitation with IRR is that multiple IRRs exist if cash flow signs (+/-) change more than once. We can illustrate this with the following simple example:

Time	0	1	2
Cash flow	-1,000	5,000	-6,000

The IRR for this investment satisfies this equation:

$$-1,000 + \frac{5,000}{(1 + \text{IRR})^1} + \frac{-6,000}{(1 + \text{IRR})^2} = 0.$$

Two values of IRR satisfy the equation: 100% and 200%, which are clearly quite different. In such cases, where cash flow signs change more than once, NPV should be used instead of IRR. Financial calculators and spreadsheet software will often misleadingly return a single IRR solution, defaulting to the lowest value.

WHICH TO USE: NPV OR IRR?

While NPV and IRR criteria usually indicate the same investment decision, in the case of mutually exclusive investment projects, a company could face a decision between one project with a larger NPV and another with a higher IRR. If the company can invest in only one project, which should it choose?

The correct choice is the project with the higher NPV. While NPV shows the firm's wealth increase in currency terms from a capital investment, the IRR solely indicates a project's rate of return (subject to the IRR reinvestment assumption) rather than its size or the period over which the IRR is earned.

Many practitioners find IRR easier to use than NPV. If the required return is 10%, for example, a project IRR of more than 10% is desirable, while an NPV amount in currency terms may be harder to interpret because the number needs to be in the context of firm size. As a practical matter, once a firm has the data to calculate the NPV, it is simple to also calculate the IRR. However, the most appropriate and theoretically sound criterion is the NPV.

Return on Invested Capital

Independent investment analysts do not have the necessary information to calculate or audit management's calculations of project NPVs or IRRs. Analysts of listed companies have consolidated financial statements and, sometimes, segment-level information, all of which are highly aggregated and include cash flows associated with many projects. Return on invested capital, also known as return on capital employed (ROCE), is a profitability measure for the total capital that management has invested, shown as Equation 3. Typically, an annual after-tax profit measure is used, so ROIC is measured *per year*.

$$\text{ROIC} = \frac{\text{After-tax operating profit}_t}{\text{Average invested capital}} = \frac{(1 - \text{Tax rate}) \times \text{Operating profit}_t}{\text{Average total LT liabilities and equity}_{t-1,t}} \quad (3)$$

The denominator is a measure of total *capital* investment, so working capital is not included. From the perspective of the balance sheet, invested capital includes the amounts in the red box:

Uses of Capital	Sources of Capital	
Cash	Short-Term Liabilities	
Short-Term Assets	Long-Term Liabilities	Invested Capital
Long-Term Assets	Ownership Capital (Equity)	

EXAMPLE 8**Return on Invested Capital**

Assume that a corporate issuer reported 24,395 in Year 2 after-tax operating profits and the following balance sheet information.

Assets:	End of Year 1	End of Year 2
Cash	4,364	6,802
Short-term assets	40,529	52,352
Long-term assets	287,857	279,769
Total assets	332,750	338,923

Liabilities and Equity:	End of Year 1	End of Year 2
Accounts payable	35,221	50,766
Short-term debt	21,142	5,877
Long-term debt	112,257	106,597
Share capital	15,688	15,688
Retained earnings	148,442	159,995
Total liabilities and equity	332,750	338,923

1. Calculate ROIC for Year 2.

Solution:

$$\text{ROIC} = \frac{\text{After-tax operating profit}_t}{\text{Average LT liabilities and equity capital}_{t-1,t}}$$

$$\text{ROIC} = \frac{24,395}{\frac{(112,257 + 15,688 + 148,442) + (106,597 + 15,688 + 159,995)}{2}}$$

$$\text{ROIC} = 8.73\%.$$

2. If an investor has a required rate of return of 10%, is this company a promising investment candidate?

Solution:

No. Although the company is profitable, the company's ROIC is below the investors' required rate of return, so the investor should look to invest elsewhere. However, this is only a single historical year, and myriad other factors will have to be considered by the investor.

ROIC has several practical benefits:

- Unlike project NPV and IRR, it can be calculated using data available to independent investment analysts.
- Unlike such measures as operating profit or operating profit margin (operating profit as a percentage of sales), ROIC accounts for the capital needed to generate returns. The relationship between operating profit margin and ROIC can be illustrated by decomposing ROIC as follows:

$$\text{ROIC} = \frac{\text{After-tax operating profit}}{\text{Average invested capital}}$$

$$\text{ROIC} = \frac{\text{After-tax operating profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Average invested capital}}$$

The term on the left is after-tax operating profit margin, and the term on the right is a measure of capital or asset turnover—how much in annual sales the company's invested capital is generating. Therefore, there are two paths to a high or increasing ROIC: profit margin and turnover. A high-margin company can earn a low ROIC if turnover is low, and a low-margin company can earn an attractive ROIC if turnover is high.

- While NPV and IRR measures allow the comparison of individual projects within a firm, ROIC is an aggregate measure to gauge a firm's ability to create value across *all* its investments. This is important because investors generally cannot invest in individual projects, only the company as a whole (some exceptions exist, such as leases and asset-backed securities, which will be discussed later in fixed-income modules).
- ROIC can be compared to investors' required rate of return. If an issuer's ROIC is greater than the investors' required rate of return over time, the issuer is creating value for investors. Conversely, if the ROIC is below the required rate of return, it is an indicator that investors would have been better off investing elsewhere; the issuer should take actions to improve turnover or profit margins, dispose of investments in underperforming areas, return capital, or seek alternative areas of investment with greater returns.
- Since ROIC measures the returns that an issuer earns on investing both debt and equity, it should be compared to a required rate of return for both its debt *and* equity investors. As discussed in prior lessons, equity is riskier than debt and therefore has a higher required return, so using solely a required return for equity investors would be an overestimate. In the next module, we will calculate a blended required rate of return as part of a broader discussion of financing.

ROIC does have limitations and shortcomings:

- ROIC, unlike NPV and IRR, is an accounting, not cash-based, measure. Operating profit and cash flows can differ materially, owing to the recognition of certain items and the difference between depreciation and capital expenditures.
- ROIC is backward looking and can be volatile from year to year based on investment activity and business conditions, so examining trends and rates of change is essential. Profitable investments can sometimes take years to earn competitive returns.
- As a highly aggregated measure, ROIC may mask profitable or unprofitable areas of the issuer.

Analysts should also be aware that there is less consensus on the measurement of ROIC than such measures as operating profit margin, particularly the denominator. Many practitioners, for example, subtract some or all intangible assets and "excess" cash from the denominator and may exclude certain long-term liabilities, such as pension and deferred tax liabilities that are not considered "invested capital." Additional calculation issues, which will be addressed later in the curriculum, include treatments of "non-recurring" expenses, leased assets, and equity from non-controlling interests.

QUESTION SET



1. True or false. During the planning and prioritization step in the capital allocation process, a firm's management should accept any investment project with an estimated positive NPV.

Solution:

False. Some projects that appear attractive in isolation may be less desirable when considered in the context of existing operations, other proposed projects, ESG factors, or financing constraints.

2. Which step in the capital allocation process *most likely* involves the calculation of NPV and IRR?

- A. Idea generation
- B. Investment analysis
- C. Planning and prioritization

Solution:

B is correct. The investment analysis step involves forecasting the amount, timing, duration, and volatility of an investment's expected cash flows and subsequently using NPV and IRR to determine whether the investment will be a wise use of capital.

A is incorrect because during the idea generation step, management gathers ideas and chooses the most promising ones for further analysis. However, in this early phase, no forecasts or profitability analysis involving NPV or IRR is conducted.

C is incorrect because during the planning and prioritization step, management selects and prioritizes profitable investment opportunities that, when considered together, are the most value enhancing on a risk-adjusted return basis. This step occurs after NPV and IRR analysis.

3. Which of the following relationships is true?

- A. If $IRR > \text{Required rate of return}$, then $NPV < 0$.
- B. If $IRR = \text{Required rate of return}$, then $NPV = 0$.
- C. $\text{Required rate of return} = \text{Risk-free rate}$.

Solution:

B is correct. IRR is the required rate of return that makes an investment's NPV equal to zero.

A is incorrect because IRR is the required rate of return for which $NPV = 0$. If IRR is greater than the required rate of return, then NPV of cash flows discounted at the required rate of return will be greater than zero, not less than zero.

C is incorrect because when calculating NPV, expected cash flows should be discounted at the required rate of return to reflect investors' opportunity cost for similarly risky projects, not a rate that ignores risk.

4. A company is considering undertaking a new capital investment project that is expected to cost \$33 million. The after-tax cash-flow projection for the

next four years is shown below. Calculate NPV and IRR assuming a required rate of return of 7.5%.

Year	1	2	3	4
Cash flow	0	16	24	7

Solution:

To calculate NPV, we use the following equation:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_T}{(1+r)^T}$$

$$NPV = -33 + \frac{0}{(1+0.075)^1} + \frac{16}{(1+0.075)^2} + \frac{24}{(1+0.075)^3} + \frac{7}{(1+0.075)^4}$$

$$NPV = \$5.41 \text{ million.}$$

Using the same equation, we can also solve for IRR by assuming that NPV = 0.

$$0 = -33 + \frac{0}{(1+IRR)^1} + \frac{16}{(1+IRR)^2} + \frac{24}{(1+IRR)^3} + \frac{7}{(1+IRR)^4}$$

$$IRR = 13.57\%.$$

5. Based on the information below, calculate ROIC for year 20X2. Values in each column are as of the end of the period. Assume operating profit of 3,890 and a tax rate of 17% in Year 20X2.

Balance Sheet		
Assets:	20X1	20X2
Cash	490	700
Short-term assets	10,520	11,790
Long-term assets	22,400	23,740
Total assets	33,410	36,230
Liabilities and equity:		
Accounts payable	5,970	6,620
Short-term debt	2,470	2,840
Long-term debt	9,880	10,550
Share capital	15,090	16,220
Total liabilities and equity	33,410	36,230

Solution:

ROIC can be calculated using the following formula:

$$ROIC = \frac{(1 - \text{Tax rate}) \times \text{Operating profit}_t}{\text{Average LT liabilities and equity}_{t-1,t}}$$

$$ROIC = \frac{(1 - 0.17) \times 3,890}{(9,880 + 15,090 + 10,550 + 16,220)/2}$$

$$ROIC = 12.48\%.$$

6. Complete the sentences by filling in the blanks using the following terms. Note that each term can be used more than once.

equity

profit margin

asset turnover

long-term liabilities

average invested capital

ROIC can be increased by increasing _____ or _____. A high-_____ company can earn a low ROIC if _____ is low, and a low-_____ company can earn a high ROIC if _____ is high.

Solution:

ROIC can be increased by increasing profit margin or asset turnover. A high-profit margin company can earn a low ROIC if asset turnover is low, and a low-profit margin company can earn a high ROIC if asset turnover is high.

7. Explain why a government-owned company may have a low required rate of return compared to a small technology company.

Solution:

The required rate of return is the discount rate that investors require given the riskiness of the project or company and the rate of return available on other similarly risky investments. Considering the business risk of both companies, a government-owned company can be perceived as a lower-risk issuer compared to a small technology company. Consequently, investors would require less compensation for risk.

4

CAPITAL ALLOCATION PRINCIPLES AND PITFALLS



describe principles of capital allocation and common capital allocation pitfalls

Capital Allocation Principles

While the analytical tools and investment decision criteria introduced in the prior lesson are quantitative and straightforward, there is considerable latitude for errors and misjudgment. To improve the decision-making process, key principles should be followed when using these tools.

- *After-tax cash flows:* Managers should evaluate capital allocation decisions based on after-tax cash flows rather than other profit- or accounting-based measures. Managers must reflect the impact of taxation on a project's expected cash flows, specifically the tax benefits derived from non-cash deductions, such as depreciation and amortization.
- *Incremental cash flows only but examine broadly:* Capital allocation analysis should ignore **sunk costs**, or those expenses that have already been incurred (or written off), and include only incremental cash flows associated with a new investment as compared to without it. However, capital investments often have an impact on the rest of the firm, which may be positive or negative. A positive effect might include cost savings with business activities that directly result from making the investment, while a negative effect might be the loss of sales from a similar product. Both are incremental cash flows, so they should be included in the analysis.
- *Timing of cash flows:* The forecasted timing, duration, volatility, and change in the possible direction of the expected cash flows must be considered for a capital investment. Notice how the NPV and IRR can change when cash flows are moved from one period to another.

Capital Allocation Pitfalls

Despite adhering to the principles, capital allocation is challenging for most firms. We divide common capital allocation pitfalls into cognitive errors and behavioral biases. Cognitive errors include calculation and other mistakes, while behavioral biases include errors in judgment and blind spots.

Cognitive Errors in Capital Allocation

- *Internal forecasting errors:* Management may make errors in their forecasts, which may be difficult to impossible for external analysts to identify. However, if significant enough, the incorrect or flawed analysis will ultimately manifest itself in failed, or underperforming, investments. Forecasting errors include incorrect cost or required rates of return inputs. For example, overhead costs such as management time, information technology support, financial systems, can be challenging to estimate. Finally, companies often fail to incorporate competitor responses into the analysis of a planned investment.
- *Ignoring costs of internal financing:* The primary source of financing for investments by large corporate issuers is cash flows from operations (i.e., not borrowing or issuing shares). Many management teams behave as if these internally generated funds are “free” but scarce and allocate them according to a budget that is closely tied to prior-period amounts. External financing from debt or equity issuance, however, is treated differently: It is used less often, typically only for larger investments, such as acquisitions, and treated as “expensive.” This is flawed logic. Internally generated capital, such as cash flow from operations, *is* equity financing because it could be returned to equity investors as a dividend. While it is not raised from equity

investors by issuing shares, it is withheld from them, incurring their opportunity cost nonetheless. Regardless of financing source, management should use appropriate risk-adjusted required rates of return to evaluate capital investments; those funded by internally generated funds do not automatically get a lower r .

This error is hard to detect and isolate from other errors and biases, but analysts should inquire about management's capital allocation process and how the source of financing influences investment decisions. If a company has an aversion to raising external capital and to returning capital, management may potentially be affected by this.

- *Inconsistent treatment of, or ignoring, inflation:* Inflation affects capital allocation in several ways. The first is whether the investment analysis is done in nominal or in real terms. Nominal cash flows include inflation effects, whereas real cash flows are adjusted downward to remove the effect of inflation (or adjusted upward to remove the effect of deflation). Companies may perform analysis in either nominal or real terms, but the approach to cash flows and discount rate should be consistent. That is, nominal cash flows should be discounted at a nominal discount rate, and real cash flows should be discounted at a real rate.

Investment analysis embeds, explicitly or implicitly, expectations for inflation, which probably does not affect all unit prices and unit costs uniformly. For example, rising oil prices are obviously beneficial for oil producers, which sell their product at a higher price. However, rising oil prices over longer time periods can be associated with rising production and capital costs, eroding some of the benefit. Second, many oil companies also own refining and chemical businesses, for which crude oil is the main input. Profitability of those businesses tends to decline as crude prices rise. If actual inflation differs from expected inflation, after-tax cash flows will be better or worse than expected depending on how specific sales outputs or cost inputs are affected.

Behavioral Biases in Capital Allocation

- *Inertia:* In a study of more than 1,600 US listed companies, researchers from McKinsey found a 0.92 correlation between levels of capital investment in a business segment or unit from one year to the next.¹ This is the result of management anchoring capital investment budgets to prior-year amounts. Analysts identify this bias by examining the level of capital investment in total, by segment, or by business line, if disclosed, and comparing it to the prior year and the return on investment. If capital investment each year is static or rising despite falling returns on investment, analyst should question the issuer's justification for a capital investment and whether management should consider alternative uses.
- *Basing investment decisions on accounting measures, such as EPS:* Managers often have an incentive to increase accounting measures, such as earnings per share, net income, or return on equity. Many capital investments, even those with high NPVs, can reduce rather than increase these accounting results in the near term, while cost cutting and share buybacks, in contrast, may have a positive effect on such measures. Paying too much attention to short-run accounting numbers can lead a company to choose investments that are not in the long-run interests of its shareholders. Analysts may observe this behavior first by examining the direct financial incentives of management based on the structure and composition of their compensation.

¹ Stephen Hall, Dan Lovullo, and Reiner Musters, "How to Put Your Money Where Your Strategy Is," *McKinsey Quarterly* (March 2012).

Second, analysts can compare the level of capital spending to historical and peer levels to judge whether management has prioritized shorter-term, accounting-based measures. That said, lower capital investment may be a sign of limited investment opportunities, in which case allocating capital to alternative uses is a wise decision.

- *Pet project bias*: Projects that receive preferential treatment, or so-called **pet projects**, are sometimes selected without thorough capital allocation analysis. In other cases, such analysis is conducted but overly optimistic projections are used to inflate the pet project's profitability. Identifying pet projects is difficult, because financial statements are usually aggregated and such projects may not meet the threshold of materiality. Instead, analysts should evaluate the corporate governance structure for warning signs that increase the chances of misallocation of capital: controlled companies or significant ownership concentration by a single individual or group, weak oversight by the board of directors, and executive compensation that is not aligned with stakeholders' interests.
- *Failure to consider investment alternatives or alternative scenarios*: While investment idea generation is the first step in the capital allocation process, many viable alternatives are never even considered at some companies. Firms also often fail to consider different outcomes, which can and should be incorporated through breakeven, scenario, and simulation analyses. This error may stem from limited capital investment experience, such as not making divestitures or acquisitions, or no experience with a failed investment. While failure is obviously undesirable, the lack of failure over time may reflect a management team that is not taking enough risk.

QUESTION SET



1. True or false: Investment projects funded using internally generated funds (e.g., cash flow from operations) should be evaluated using a lower required rate of return as compared to projects funded using debt or share issuance.

Solution:

False. Ignoring the cost of internal financing is a common cognitive error. Internally generated capital, such as cash flow from operations, is equity financing because it could be returned to equity investors as a dividend or share repurchase. While internally generated capital is not raised from equity investors by issuing shares, it is withheld from them, therefore incurring their opportunity cost. Regardless of financing source, management should use an appropriate risk-adjusted required rate of return to evaluate capital investments.

2. Alexandra Tolonen, an investment analyst, prepares forecasts for expansion of a car battery plant and wants to consider the effect of rising lithium carbonate prices. Tolonen adjusts future after-tax cashflows downward to remove the effects of an expected lithium carbonate price increase of 5%

and uses real discount rates to calculate the project's NPV. In the second year of the project, the actual lithium carbonate price increased by 10%.

True or false. Given that Tolonen has used inflation-adjusted cash flows and discount rates, the rise in lithium carbonate prices will not impact the project's profitability.

Solution:

False. Even though Tolonen was consistent in using real cash flows and real rates while preparing the forecast, this fact does not make the project immune to changes in inflation. If actual inflation differs from expected inflation, after-tax cash flows will be better or worse than expected, depending on how specific cost inputs are affected.

3. An analyst is analyzing company XYZ and has gathered annual invested capital and ROIC for each of the three XYZ business segments.

Segment	Capital Expenditures (\$ m)			ROIC		
	20X0	20X1	20X2	20X0	20X1	20X2
A	264	282	303	7.50%	7.10%	6.80%
B	297	318	340	10.00%	8.90%	7.10%
C	211	226	242	6.90%	7.80%	9.00%

Based on the information provided, XYZ's management is *most likely* prone to which of the following biases?

- A. Inertia
- B. Sunk cost
- C. Pet project

Solution:

A is correct. Inertia can be identified by examining the level of capital investment in total, by segment, or by business line, if disclosed, and comparing it to the prior year and the return on investment. If capital investment each year is static or rising despite falling returns on investment, the analyst should question the issuer's justification for a capital investment and whether management should consider alternative uses. In the case of XYZ, we can observe that for segments A and B, ROIC is decreasing, but both segments are getting a higher capital allocation each year.

B is incorrect because sunk cost is related to the capital allocation process in determining a potential project's profitability. Sunk costs, or those expenses that have already been incurred, should be ignored when evaluating potential projects.

C is incorrect because a detailed view of individual investment projects undertaken by XYZ's management is not provided. Identifying pet projects from outside the firm is difficult, because financial statements are aggregated and such projects may not meet the threshold of materiality.

4. Bradshaw, a financial analyst, prepares a forecast of future expected gross (pre-tax) cash flows for an investment project. Bradshaw also forecasts future depreciation related to that project and assumes a required rate of return 6%. Based on the information provided and a tax rate of 18%, calculate

the NPV of the project. In this jurisdiction, depreciation is not deductible for taxes.

Cash Flow and Depreciation Forecast

Time	0	1	2	3
Gross cash flow	-7.50	4.50	4.50	6.00
Depreciation	0.00	-1.00	-1.00	-1.00

Solution:

To calculate NPV for this project, Bradshaw should first calculate after-tax cash flows and consider depreciation only to the extent that it is tax deductible and reduces taxes, because it is non-cash. After-tax cash flows can be calculated by applying the following formula to all cash flows to be received in the future.

$$\text{After-tax cash flow}_t = \text{Gross cash flow}_t \times (1 - \text{Tax rate}).$$

After-Tax Cash Flow Forecast

Time	0	1	2	3
After-tax cash flow	-7.50	3.69	3.69	4.92

The calculation of NPV is follows:

$$\text{NPV} = -7.5 + \frac{3.69}{(1 + 0.06)^1} + \frac{3.69}{(1 + 0.06)^2} + \frac{4.92}{(1 + 0.06)^3}.$$

$$\text{NPV} = 3.396$$

5. Explain why some managers might reject projects that significantly increase shareholder value (i.e., have a high NPV).

Solution:

Managers may have an incentive to increase accounting profitability measures, such as earnings per share, net income, or return on equity. Many capital investments, even those with high NPVs, can reduce rather than increase these measures in the near term, while cost cutting and share buybacks, in contrast, may have a positive effect on such measures. If this incentive is strong enough, management may forgo high-NPV projects in favor of actions that increase near-term earnings per share.

REAL OPTIONS

5



describe types of real options relevant to capital investments

The capital allocation process described earlier implied that firms make all capital investment decisions for a project at inception, maintaining one course of action throughout the life of a project. In practice, firms often have alternatives, known as **real options**, that can alter the value of capital investments. That is, some capital investment decisions are in fact a series of decisions; some are taken today, while

others can be postponed and will be based on future economic events or information. Similar to financial options, such as derivatives, real options grant a firm the right, but not the obligation, to take an action in the future. A company should only pursue (or **exercise**) a real option if it is value enhancing.

Just as the value of a financial option depends on the future value of an underlying asset, real options are contingent on future events for a company. Real options offer flexibility to companies that can greatly enhance the NPV of companies' capital investments in one or more of the following forms:

- *Timing option:* Instead of investing now, the company can choose to delay its investing decision. In doing so, companies forgo near-term returns and hope to obtain improved information for the NPV of projects selected. Investments may be sequenced over time, so that investing in a project creates the option to make future investments.
- *Sizing option:* An **abandonment option** allows a company to abandon the investment after it is undertaken if the financial results are disappointing. At some future date, if the cash flow from abandoning an investment exceeds the present value of the cash flows from continuing the investment, the company should exercise the abandonment option. Conversely, if the company can make additional investments when future financial results are strong, the company has a **growth option**, or expansion option.
- *Flexibility option:* Companies may also benefit from operational flexibility other than abandonment or expansion once an investment is complete. For example, suppose a firm finds that demand for a product or service exceeds capacity. Management may be able to exercise a **price-setting option**. By increasing prices, the company could benefit from the excess demand, which it cannot do by increasing production. Alternatively, a firm may consider **production flexibility options** to alter production when demand differs from its forecast. For example, a firm may add overtime or extra shifts to increase production for a given capacity.
- *Fundamental option:* The entire value of an investment may depend on factors outside the firm's control, such as the price of a commodity. For example, the value of an oil well or refinery investment is contingent on the price of oil. The value of a gold mine is contingent on the price of gold. If oil prices were low, a company likely would not choose to drill a well. If oil prices were high, it would go ahead and drill. Many R&D (research and development) projects are also very similar to such options.

Firms use several approaches in evaluating capital investments with these characteristics, such as the following:

1. Investment analysis *without* considering options: If the NPV is positive without considering real options and the project involves real options that could increase its net present value, then the NPV represents a *minimum* return and the firm should make the investment.
2. Calculation of NPV with real options: Under this approach, the firm calculates a project's NPV based on expected cash flows and then subtracts the incremental cost of the real option and adds its associated value, as shown in Equation 4:

$$\text{Project NPV} = \text{NPV (without options)} - \text{Option cost} + \text{Option value.} \quad (4)$$

- Decision trees and option pricing models: Either approach may be used by firms seeking to assess the value of a capital investment that involves future sequential decisions and alternative outcomes for a given investment. These models often assign a probability and expected timing to future outcomes, which are used to calculate the project's NPV.

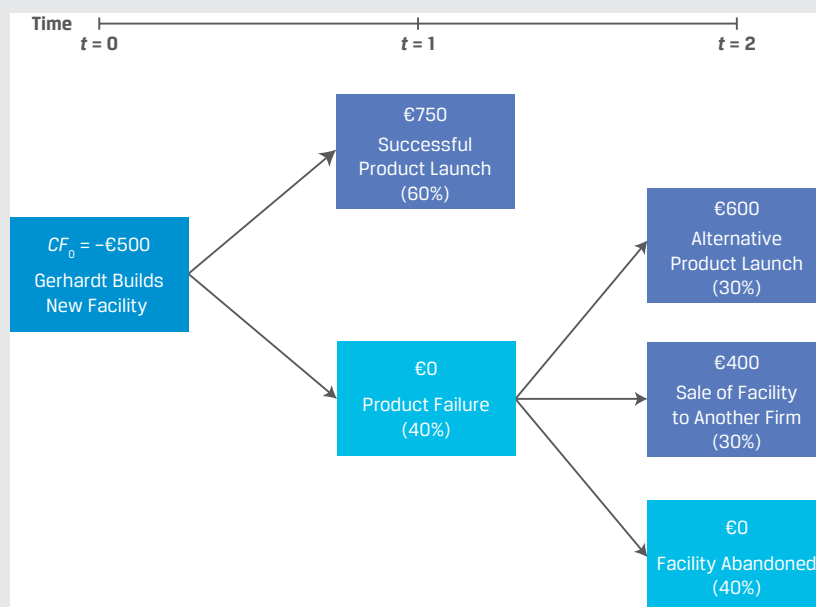
To calculate the return on capital investments with or without real options, firms must often assume an expected probability for future events. The following example provides an illustration using a decision tree for evaluating the return on a capital investment with and without real options.

EXAMPLE 9

Gerhardt Corporation Capital Allocation Using a Decision Tree

Assume that Gerhardt Corporation is considering a €500 million outlay for a capital investment in a facility to produce a new product. Gerhardt assigns a 60% probability to a successful product launch, which is expected to return €750 million in one year's time. Gerhardt's finance team has also conducted an analysis of alternative facility uses, summarizing the timing and probability of cash flows associated with each real option in the following decision tree.

Gerhardt Corporation Decision Tree



- Calculate the NPV of Gerhardt's project *without* real options using a 10% required rate of return (r).

Solution:

The NPV without real options uses Equation 1 and a probability-weighted cash flow if the product is successfully launched (60%) and a 40% probability that future cash inflows are zero:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + , \text{or}$$

$$NPV = -500 + \frac{(0.6 \times 750)}{(1.10)}$$

Because NPV = -€90.91, Gerhardts should not pursue the project, based on the NPV decision rule.

2. Calculate the NPV of Gerhardts proposed project *with* real options and a 10% required rate of return.

Solution:

Calculate NPV with real options using Equation 1 and probability-weighted cash flows in future periods:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2}$$

$$= -500 + \frac{(0.6 \times 750)}{(1.10)^1} + \frac{[(0.4 \times 0.3) \times 600] + [(0.4 \times 0.3) \times 400]}{(1.10)^2}$$

The NPV *with* real options equals €8.26, which implies based on the NPV decision rule that Gerhardts should invest in the new production facility if alternative uses in the future are considered. Note that the cash flow calculation for the second period is based on the conditional probabilities of specific outcomes. That is, in the case of both the possible alternative product launch and facility sale to another firm, the 30% probability of each of these mutually exclusive outcomes *given* a product failure in Period 1 (40%) makes the conditional probability of each event equal to 12% (= 0.4 × 0.3).

As the previous example shows, the inclusion of real options in the capital allocation process to incorporate different scenarios related to internal and external events and their expected impact on future after-tax cash flows can materially change the evaluation of an investment.

QUESTION SET



1. Which of the following statements about real options is true?
 - A. Using option pricing models estimates an option's value with the highest accuracy.
 - B. Real options allow companies to abandon an investment project if its profitability is poor.
 - C. Real options would allow a refinery to hedge future prices of crude oil needed for production.

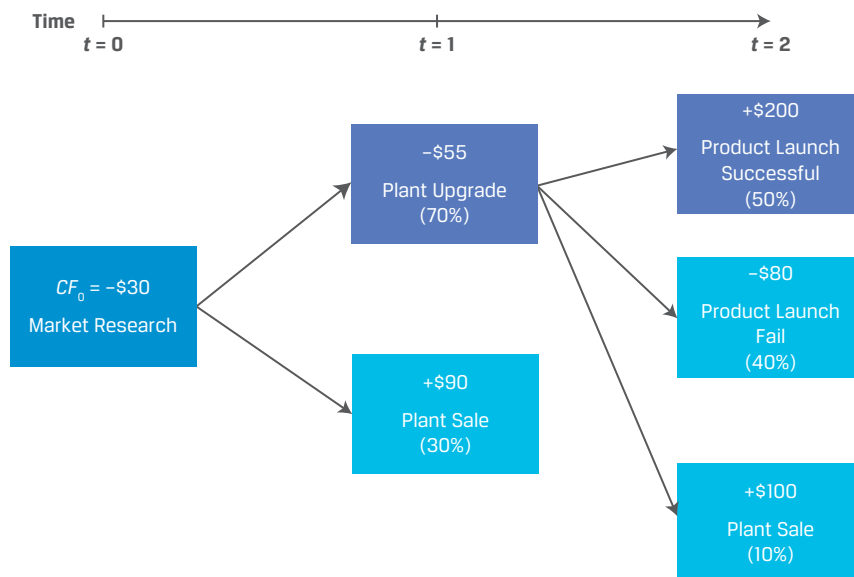
Solution:

B is correct. An abandonment option is a type of real option, which allows a company to abandon the investment after it is undertaken.

A is incorrect because even though real options can be priced using option pricing models, the estimates require multiple unobservable inputs, such as probabilities of events and timing of their occurrence. The complexity does not necessarily improve accuracy.

C is incorrect because real options provide companies with flexibility with regard to future decisions; however, they do not allow the hedging of commodity prices. The risk of crude oil price changes can be hedged using financial options, not real options.

2. SclarCorp is planning a market research campaign to gauge interest in a new type of product. If interest in the new product is high, the company will need to upgrade its existing production plant to allow for product manufacturing. Alternatively, if interest is low, SclarCorp will sell the plant for \$90 million. The required rate of return for the project is 7.5%. A SclarCorp analyst summarized the timing and probability of cash flows associated with each alternative use in the following decision tree.



Based on the decision tree, match the following factors with the impact on the capital project's value (option value):

Increase in market research cost

Decrease in market research cost

Increase in plant sale price

Decrease in plant sale price

Increasing required rate of return

Decreasing required rate of return

Increases Project Value

Decreases Project Value

Solution:

Increases Project Value**Decreases Project Value**

Decrease in market research cost

Increase in market research cost

Increase in plant sale price

Decrease in plant sale price

Decreasing required rate of return

Increasing required rate of return

The calculation of the NPV of the project, considering all alternatives and their probabilities, can be carried out as follows:

$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2}$$

$$NPV = -30 + \frac{(-55 \times 0.7 + 90 \times 0.3)}{(1 + 0.075)^1} + \frac{(200 \times (0.7 \times 0.5) - 80 \times (0.7 \times 0.4) + 100 \times (0.7 \times 0.1))}{(1 + 0.075)^2}$$

$$NPV = \$6.549.$$

Impact of increase in market research cost

If the market research cost increases, for example, by 10 (to -40), the NPV of the entire project will decrease by the same amount. Given that initial outlay occurs at $t = 0$, it does not need to be discounted.

Impact of increase in plant sale price

If the plant sale price increases (either in Year 1 or Year 2), the NPV of the entire project will increase by a smaller amount, given that corresponding cash flow needs to be probability adjusted and discounted to T_0 .

Impact of increase in required rate of return

An increase in the required rate of return will decrease the NPV of the entire project, given that it is used to discount future cash flows.

3. Company XYZ is considering expanding its distribution center in a foreign country. The local government is working on a new environmental regulation that introduces subsidies and tax breaks for investments related to renewable energy. Once the new law is approved, XYZ could upgrade the distribution center at lower cost. If the company decides to wait for the new regulation to come into effect, it will have to bear project-related costs of \$1.8 million. XYZ's finance team estimates that if the company waits, the NPV of the project will be \$9.7 million, compared to a current value of \$8.9 million. Calculate option value.

Solution:

To determine option value, we need to compare the project value with and without the option and additionally consider option cost.

$$\text{Project NPV (with option)} = \$9.7 \text{ million.}$$

$$\text{Project NPV (without option)} = \$8.9 \text{ million.}$$

$$\text{Option cost} = \$1.8 \text{ million.}$$

$$\text{Project NPV (with option)}$$

$$= \text{Project NPV (without option)} - \text{Option cost} + \text{Option value.}$$

$$\$9.7 \text{ million} = \$8.9 \text{ million} - \$1.8 \text{ million} + \text{Option value.}$$

$$\text{Option value} = \$2.6 \text{ million.}$$

PRACTICE PROBLEMS

The following information relates to questions 1-5

Larissa Soroka, an analyst at ABC company, has been asked to prepare cash flow forecasts for two mutually exclusive investment projects related to new products. ABC's management asks Soroka to include the cost of market research that was recently completed as well as the potential loss of revenue from existing products that could occur if either project is undertaken. Soroka presents the forecast in Exhibit 1 and is asked to calculate IRR and NPV for both projects. Investors in ABC have a required rate of return of 8%.

Exhibit 1

Cash Flow Forecast for Projects A and B					
Time	0	1	2	3	4
Project A	(18.5)	4.5	6.0	6.0	5.5
Project B	(33.5)	(2.5)	(1.0)	24.0	25.5

ABC's management asks Soroka to consider in her forecast the impact of a six-month delay in all future cash flows and estimate the impact of that event on IRR and NPV.

After reviewing the forecast, ABC's management asks Soroka to estimate ABC's ROIC for 20X2. ABC earned operating profit of \$8,830, had an effective tax rate of 22%, and reported the balance sheet in Exhibit 2.

Exhibit 2

ABC Balance Sheet (end-of-period values)		
Assets:	20X1	20X2
Cash	1,600	1,720
Short-term assets	30,450	29,910
Long-term assets	60,250	62,060
Total assets	92,300	93,690
Liabilities and equity:	20X1	20X2
Accounts payable	12,930	11,620
Short-term debt	8,030	8,390
Long-term debt	25,040	25,910
Share capital	39,800	40,990

Liabilities and equity:	20X1	20X2
Retained earnings	6,500	6,780
Total liabilities and equity	92,300	93,690

ABC's management has an ROIC objective of at least 9.2% and asks Soroka for her recommendation about the projects.

- When preparing the cash-flow forecasts for both projects, Soroka should include:
 - only the cost of the market research.
 - only the loss of revenue from existing products.
 - both the market research cost and the loss of revenue from existing products.
- With regard to Project A and Project B, which of the following is true?
 - Both projects should be invested in according to the IRR decision rule.
 - Both projects should be invested in according to the NPV decision rule.
 - Only Project B should be invested in according to the IRR decision rule.
- The *most likely* impact from the cash-flow timing considered by Soroka is that:
 - both IRR and NPV would decrease.
 - both IRR and NPV stay unchanged.
 - only IRR would decrease but NPV would increase.
- Based on ABC's balance sheet presented in Exhibit 2, Soroka should calculate:
 - average invested capital of \$72,510 and ROIC of 9.50%.
 - average invested capital of \$80,720 and ROIC of 10.94%.
 - average invested capital of \$92,995 and ROIC of 9.50%.
- Considering ABC management's ROIC-based investment criterion and the IRR and NPV of both projects, Soroka should recommend to:
 - reject both projects A and B.
 - invest only in Project B because it has a higher NPV.
 - invest only in Project A because has positive cash flow during all four years.

SOLUTIONS

1. B is correct. Capital allocation analysis should include only incremental cash flows associated with a new investment. The loss of revenue from existing products is an incremental negative effect that should be included in the analysis. The market research costs in this case are a sunk cost because the research has already been completed and therefore does not affect cash-flow estimates, no matter whether ABC undertakes either of these projects or neither of them.
2. C is correct. The IRR decision rule is to invest if the IRR exceeds the required rate of return or hurdle rate. Project B's IRR is 8.97%, which exceeds the required rate of return of 8%; however, Project A's IRR is 7.04%, which is below the required rate of return of 8%.

The NPV of both projects can be calculated as follows:

$$NPV_A = -18.5 + \frac{4.5}{(1+0.08)^1} + \frac{6}{(1+0.08)^2} + \frac{6}{(1+0.08)^3} + \frac{5.5}{(1+0.08)^4} = -0.38.$$

$$NPV_B = -33.5 + \frac{-2.5}{(1+0.08)^1} + \frac{-2.5}{(1+0.08)^2} + \frac{24}{(1+0.08)^3} + \frac{25.5}{(1+0.08)^4} = 1.12.$$

Using the same equation, we can solve for the IRRs by assuming that NPV = 0.

$$0 = -18.5 + \frac{4.5}{(1+IRR_A)^1} + \frac{6}{(1+IRR_A)^2} + \frac{6}{(1+IRR_A)^3} + \frac{5.5}{(1+IRR_A)^4}.$$

$$IRR_A = 7.04\%.$$

$$0 = -33.5 + \frac{-2.5}{(1+IRR_B)^1} + \frac{-2.5}{(1+IRR_B)^2} + \frac{24}{(1+IRR_B)^3} + \frac{25.5}{(1+IRR_B)^4}.$$

$$IRR_B = 8.97\%.$$

A is incorrect because Project B's IRR is 8.97%, which exceeds the required rate of return of 8%; however, Project A's IRR is 7.04%, which is below the required rate of return of 8%. Consequently, only Project B meets the IRR decision rule.

B is incorrect because the NPV decision rule is to invest if the NPV is greater than 0. Project B's NPV is \$1.12 million, while Project A's NPV is -\$0.38. Consequently, only Project B meets the NPV decision rule.

3. A is correct. The forecasted timing of cash flow is an important factor affecting both projects' IRR and NPV. In the case of delaying all future cash flows from both projects by six months, the result would be a lower IRR and a lower NPV. Given that all future cash flows are to be received six months later, their present value decreases; hence, the NPV and IRR of an entire project also decrease. B is incorrect because when cash flows from the investment projects are delayed by six months, both projects' NPV and IRR would decrease, not stay unchanged. C is incorrect because when cash flows from the investment projects are delayed by six months, both project's NPV and IRR would decrease.
4. A is correct. To calculate ROIC, we can use the following formula:

$$ROIC = \frac{(1 - \text{Tax rate}) \times \text{Operating profit}_t}{\text{Average invested capital}_{t-1,t}},$$

where

$$\text{Average invested capital}_{t-1,t} = \frac{(\text{Debt} + \text{Equity})_{20X1} + (\text{Debt} + \text{Equity})_{20X2}}{2}$$

$$\text{Average invested capital}_{t-1,t} = \frac{[(25,040 + 39,800 + 6,500) + (25,910 + 40,990 + 6,780)]}{2}$$

$$\text{Average invested capital}_{t-1,t} = 72,510.$$

$$\text{ROIC} = \frac{(1 - 0.22) \times 8,830}{72,510}.$$

$$\text{ROIC} = 9.50\%.$$

5. A is correct. ABC's management aims to achieve a minimum ROIC above 9.20%, but the IRR of both projects fails to meet this investment criterion. Even though Project B has a positive NPV, if it were undertaken, it would reduce ROIC.

B is incorrect because even though Project B's NPV is \$1.12 million (which increases ABC's value to shareholders), its IRR is 8.97%, which is below the target ROIC of 9.20%. Consequently, if Project B was undertaken, it would lower ABC's ROIC.

C is incorrect because Project A's IRR is below ABC management's target ROIC of 9.2%. Additionally, Project A's NPV is negative, so it decreases ABC's shareholder value.

LEARNING MODULE

6

Capital Structure

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	calculate and interpret the weighted-average cost of capital for a company
☐	explain factors affecting capital structure and the weighted-average cost of capital
☐	explain the Modigliani–Miller propositions regarding capital structure
☐	describe optimal and target capital structures

INTRODUCTION

1

Earlier lessons addressed a firm's short-term activities and longer-term capital investment decisions. We now turn to the last part of the balance sheet: long-term debt and equity financing, known as a firm's capital structure. The first lesson introduces the basic objective of most managers when choosing a capital structure: minimizing the firm's weighted-average cost of capital. The second lesson considers the internal and external factors that influence a firm's choice of—and investors' willingness to offer—debt versus equity financing. While capital structure seems like an important decision for boards and managers, it is the present value of future cash flows, rather than a firm's capital structure, that primarily drives a firm's value, a central insight in the influential work of Franco Modigliani and Merton Miller. In the third lesson, we explore the simplifying assumptions used by Modigliani and Miller to demonstrate the irrelevance of capital structure to firm value, and then we relax these assumptions to show the impact of both taxes and the cost of financial distress. In the final lesson, we discuss optimal and target capital structures for issuers.

LEARNING MODULE OVERVIEW



- An issuer's cost of capital is composed of its cost of debt and equity, which are defined as its investors' required rates of return on debt and equity financing. An issuer's cost of capital is estimated using a weighted average of the costs of debt and equity, using either current market value or management's target weights of each type of financing as the weights.

- Issuers generally aim to minimize their weighted-average cost of capital and to match the duration of their assets and financing. Managements' target capital structures are usually stated using book values or indirectly through financial leverage ratios, such as a maximum ratio of debt or net debt to EBITDA or a minimum credit rating.
- While management has some influence, the total amount and type of financing needed or the weights in the WACC calculation often depends on the issuer's business model (e.g., capital intensive or capital light) and on the company's life cycle stage.
- The component costs of debt and equity are determined by top-down factors, such as financial market and industry conditions, and by issuer-specific factors, including the stability of revenues and operating and financial leverage.
- Modigliani and Miller (MM) showed, under a restrictive set of assumptions including no taxes, that an issuer's capital structure is irrelevant to firm value. MM relaxed the assumptions by considering corporate taxes, financial distress, and bankruptcy costs and showed that capital structure does matter, although far less than an issuer's future cash flows, for firm value.
- Under MM's static trade-off theory of capital structure, the optimal capital structure occurs where the tax benefit of debt equals the financial distress costs associated with debt.
- The pecking order theory of capital structure is an alternative to the static theory and suggests that a firm will use internal financing as much as possible. If external financing is needed, the firm prefers private debt over public debt and will limit the use of equity financing if possible.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

1. In computing WACC, the cost of equity is higher than the cost of debt because the:

- A. cost of debt is set by management.
- B. distributions to shareholders are tax deductible.
- C. debt investors take less risk than equity investors.

Solution:

C is correct. Debt is less risky than equity because it has a priority, contractual claim on the firm's cash flow. Additionally, some debt is secured with an underlying asset. In contrast, equity is a residual claim.

A is incorrect because an issuer's cost of debt, like its cost of equity, is determined by financial market participants.

B is incorrect because, generally, distributions to shareholders, such as dividends, are not tax deductible while interest expense is tax deductible in many jurisdictions.

2. Nutry, Inc., has a capital structure of 30% debt and 70% equity, and interest expense is tax deductible. Debt investors require a before-tax return of 5%,

and equity investors' required return is 10%. If the marginal corporate tax rate is 20%, the WACC is closest to:

- A. 5.9%.
- B. 8.2%.
- C. 8.5%.

Solution:

B is correct. Nutry's WACC is calculated as follows:

$$\text{WACC} = (\text{Weighting of debt} \times \text{Cost of debt}) + (\text{Weighting of equity} \times \text{Cost of equity})$$

$$= (0.3)(5\%)(1 - 0.2) + (0.70)(10\%) = 8.2\%.$$

Thus, the WACC for Nutry is 8.2%. The cost of debt is stated on an after-tax basis because interest expense is tax deductible in Nutry's jurisdiction.

3. The optimal capital structure is determined where the benefit of the debt tax shield is offset by the cost of financial distress under the:

- A. pecking order theory.
- B. free cash flow hypothesis.
- C. static trade-off theory of capital structure.

Solution:

C is correct. The static trade-off theory of capital structure incorporates both the value-enhancing effect of the tax shield and the value-reducing impact of the costs of financial distress. At the optimal level of debt, the financial distress cost equals the tax benefit of debt.

The pecking order theory states that firms use internally generated funds first because there are no floatation costs or negative signals. If more funds are needed, firms issue debt and only as a last resort will they issue equity.

There is no optimal capital structure.

The free cash flow hypothesis argues that higher debt levels discipline managers by forcing them to manage the company efficiently and use cash wisely so the company can make its interest and principal payments.

4. True or False: Managers cannot precisely estimate the optimal capital structure, but they often establish a target capital structure. An issuer's actual capital structure may differ from its target based on business and financial market conditions.

- A. True
- B. False

Solution:

A is correct. Since management cannot estimate the optimal capital structure in practice, it instead sets a target capital structure. The actual capital structure may deviate from the target for several reasons. First, the firm may be able to issue debt at a favorable rate, so management takes advantage of these opportunities. Second, changing market values of the firm's debt and equity may cause the firm's actual capital structure to differ from its target. Transaction costs make it costly to constantly adjust to the changing market values.

5. The amount and type of financing needed or the weights in the WACC calculation depend on the issuer's:

- A. business model.
- B. financial leverage.
- C. proportion of fixed cost to total costs.

Solution:

A is correct. The amount and type of financing needed or the weights in the WACC calculation depend on the business model and the stage in the company's life cycle. Some businesses require large amounts of assets and are capital intensive. Other business models require less assets and are capital light.

B and C are incorrect because the proportion of fixed assets to total costs (operating leverage) and financial leverage are issuer-specific factors that influence the component costs of debt and equity.

6. Under Modigliani and Miller (MM), if one assumes no taxes and no financial distress cost, among other assumptions, the value of the company is:

- A. determined by its capital structure.
- B. determined solely by its expected future cash flows.
- C. set so the value of levered company is greater than that of the unlevered company.

Solution:

B is correct. MM showed that under a set of restrictive assumptions, including zero taxes, the firm's value is unaffected by its financing mix or capital structure. It is the firm's cash flow that is the primary determinant of value. If the market value of the company is not affected by its financing mix, then the value of the levered firm is equal to the value of the unlevered firm.

2

THE COST OF CAPITAL



calculate and interpret the weighted-average cost of capital for a company

As discussed in prior lessons, issuers make capital investments that are expected to have a return on investment greater than the required rate of return. An *issuer's* required rate of return on its capital investments is derived from its *investors'* required rates of return, adjusted for specific risks in the project. If the issuer has exhausted its positive-NPV project opportunities, it should return capital to investors so they can invest elsewhere and earn their required rate of return. Not doing so would destroy value for investors.

For an issuer, its required rate of return is also known as its **cost of capital**. Since issuers use both debt and equity, the cost of capital is composed of the **cost of debt** and the **cost of equity**. As described in prior lessons, debt is less risky than equity for investors because it is a priority, fixed claim on a firm's cash flows while equity is a residual claim of indeterminate length. Additionally, debt is sometimes secured with an underlying asset that would be transferred to the debtholder in the event of

default, further reducing risk for the debt investor. Therefore, debt investors have lower required rates of return than equity investors because they take less risk; equivalently, an issuer's cost of debt is lower than its cost of equity financing.

An issuer's **weighted-average cost of capital (WACC)** blends its costs of debt and equity to obtain a single cost of capital. The WACC, after adjusting for any project-specific risks, is what issuers use as r in NPV analysis and as the hurdle rate for IRR analysis.

The calculation of WACC is shown in Equation 1:

$$\text{WACC} = (\text{Cost of debt} \times \text{Weighting of debt}) + (\text{Cost of equity} \times \text{Weighting of equity}). \quad (1)$$

The estimation of each component of Equation 1 will be covered in much greater detail in lessons on fixed income and equity later in the curriculum. For now, note the following observations.

- The cost of debt for an issuer is debt investors' required rate of return on debt financing. The interest rate on existing unsecured loans and bonds is typically a good starting point. However, if we want a forward-looking measure, meaning the interest rate on *new* debt raised to finance a new project, we might instead look to what interest rates similarly situated companies have recently borrowed at. Additionally, in jurisdictions where interest expense is tax deductible, we reduce the nominal cost of debt by multiplying by $(1 - \text{Tax rate})$ to obtain an after-tax amount.
- The weightings of debt and equity are either their market value proportions or target weights provided by management, which are typically on a book value basis. Market value weights are more commonly used because book values reflect historical prices of debt and equity, while investors' opportunity costs are based on current market prices of debt and equity.
- The cost of equity for an issuer is equity investors' required rate of return. Unlike the cost of debt, we do not have a historical interest rate to observe as a starting point. We do know that the cost of equity is higher than the cost of debt because of equity's riskiness and because distributions to shareholders are not tax deductible.

One simplistic approach is to simply observe the historical returns on equities in general—because perhaps equity investors are expecting a similar rate of return going forward—and adjust that rate for the company-specific considerations we will discuss in the next lesson, such as how stable a company's cash flows are.

One long-running broad market index of stocks has increased by a compound annual growth rate (CAGR) of 10% from 1928 to 2021, so 10% is a starting estimate for the cost of equity we'll use for these lessons. Expected and required rates of return for equity investors are rich topics that will be discussed in more detail later in the curriculum.

- If an issuer has additional types of financing with different risk and return characteristics from those of debt and equity—for example, preferred stock and non-controlling interests—the weighted-average after-tax cost of that financing needs to be added to Equation 1 as well.

KNOWLEDGE CHECK: COMPUTING WACC

1. Assume that ABC Corporation is financed with 40% debt and 60% equity. Also assume that interest expense is tax deductible. ABC Corporation wishes to maintain these proportions as it raises new funds.

ABC's debt investors' required rate of return, measured before taxes, is 4%, and its equity investors' required rate of return is 10%. If the company's marginal tax rate is 23%, what is ABC's weighted-average cost of capital?

Solution:

ABC's weighted-average cost of capital is 7.23%:

$$\text{WACC} = [(1 - \text{Tax rate}) \times \text{Pre-tax cost of debt} \times \text{Weighting of debt}] + (\text{Cost of equity} \times \text{Weighting of equity}).$$

$$\text{WACC} = [0.04 \times (1 - 0.23) \times 0.40] + (0.10 \times 0.60).$$

$$\text{WACC} = 7.23\%.$$

DISCUSSION

If ABC's management maintains the company's current mix of financing (40% debt, 60% equity), what would happen to ABC's weighted-average cost of capital if its cost of debt decreases by 1%? If its cost of equity increases by 1%? What about if the company's tax rate changes? Write your responses on this lesson's discussion board on the LES.

As demonstrated in the prior module, capital investments increase firm value if their returns exceed required rates of return. The prior module focused on the return on investment as the main driver of value, but it is also clear that a lower required rate of return would increase NPV, too, or at least provide a lower threshold for value-creative investments. This forms the basis for one of the most common objectives for managers in **capital structure** decisions, the mix of debt and equity financing: Choose whichever one leads to the lowest WACC. However, the cost of debt and equity are not chosen by management but, rather, are determined in financial markets by investors, so it is a dynamic and non-trivial endeavor. The second objective of management in choosing a capital structure is, where possible and economical, matching the liquidity or time horizon with that of its capital investments.

QUESTION SET

1. XYZ corporation has a capital structure of 30% debt and 70% equity, and interest expense is tax deductible. Debt investors require a before-tax return of 6%, and equity investors' required return is 12%. If the marginal corporate tax rate rises from 20% to 25%, the change in the WACC is closest to:
 - A. -0.09%.
 - B. 0.09%.

C. 0.30%.

Solution:

A is correct. XYZ's WACC at a tax rate of 20% is calculated as follows:

$$\text{WACC} = (\text{Weighting of debt} \times \text{Cost of debt}) + (\text{Weighting of equity} \times \text{Cost of equity})$$

$$= (0.3)(6\%)(1 - 0.2) + (0.70)(12\%) = 9.84\%.$$

XYZ's WACC at a tax rate of 25% is calculated as follows:

$$\text{WACC} = (0.3)(6\%)(1 - 0.25) + (0.70)(12\%) = 9.75\%.$$

Thus, WACC declines by 0.09% as the after after-tax cost of debt declines from 4.8% to 4.5%.

2. True or False: Since the cost of debt and equity are controlled by the firm, managers can lower the cost of capital for the firm by reduce reducing the cost of debt and equity used in their capital allocation process.

A. True

B. False

Solution:

B is correct. This statement is false because the costs of debt and equity are not selected by management but are determined in financial markets by investors, though they are influenced by management's actions.

Questions 3 and 4 relate to the following information:

Company X has the following on the right-hand side of its balance sheet:

Bonds \$400,000

Common stock (40,000 shares) \$600,000

Total liabilities and equity \$1,000,000

The price of Company X stock is currently \$20 per share. The required return before tax on debt is 5%, and the required return on equity is 10%.

3. In calculating WACC for Company X, the weight for debt using book values for the balance sheet components is likely to be _____ than the weight for debt using market values for the balance sheet components.

A. lower

B. the same

C. higher

Solution:

A is correct.

The book value weights are computed as follows:

$$W_d = \$400,000 / \$1,000,000 = 0.40.$$

$$W_e = \$600,000 / \$1,000,000 = 0.60.$$

The market value of equity is equal to $\$20 \times 40,000 \text{ shares} = \$800,000$.

The market value weights are computed as follows:

$$W_d = \$400,000 / \$1,200,000 = 0.33.$$

$$W_e = \$800,000 / \$1,200,000 = 0.67.$$

Thus, the book value weight for debt (0.40) is higher than the market value weight (0.33).

4. If the marginal corporate tax rate is 20% and the stock price increases to \$25, the WACC for Company X is closest to:

- A. 7.60%.
- B. 8.26%.
- C. 8.55%.

Solution:

B is correct.

The book value weights are computed as follows:

$$W_d = \$400,000 / \$1,000,000 = 0.40.$$

$$W_e = \$600,000 / \$1,000,000 = 0.60.$$

The market value of equity is equal to $\$25 \times 40,000$ shares = \$1,000,000.

The market value weights are computed as follows:

$$W_d = \$400,000 / \$1,400,000 = 0.29.$$

$$W_e = \$1,000,000 / \$1,400,000 = 0.71.$$

The appropriate weights for the WACC calculation are the market weights. Company X's WACC, using the market weights, is calculated as follows:

$$\begin{aligned} \text{WACC} &= (\text{weighting of debt} \times \text{cost of debt}) + (\text{weighting of equity} \times \text{cost of equity}) \\ &= (0.29)(5\%)(1-0.2) + (0.71)(10\%) = 8.26\% \end{aligned}$$

5. Fill in the blanks using the following two terms:

higher

lower

Shareholder value is increased by a _____ return on investment and a capital structure that results in a _____ WACC.

Solution:

Shareholder value is increased by a higher return on investment and a capital structure that results in a lower WACC.

3

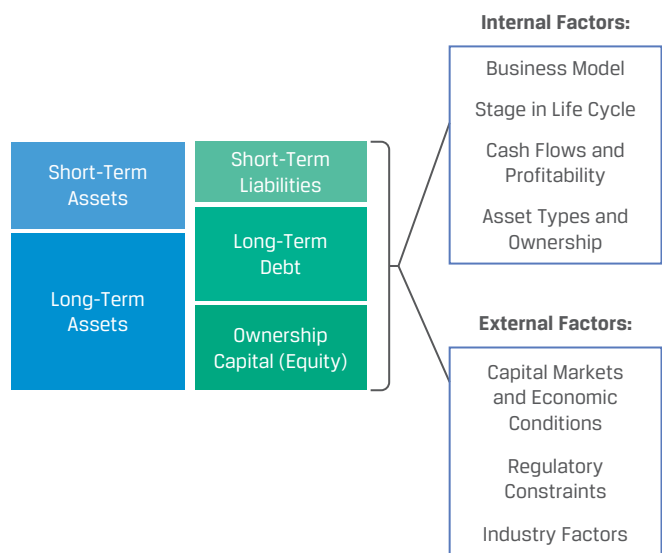
FACTORS AFFECTING CAPITAL STRUCTURE



explain factors affecting capital structure and the weighted-average cost of capital

Issuers desire a capital structure that minimizes its weighted-average cost of capital and generally matches the duration of its assets. The total amount and type of financing needed are generally determined by the issuer's business model and its position in the corporate life cycle. The costs of debt and equity are determined in financial markets by top-down factors that affect debt and equity markets generally, as well as investors' assessments of issuer-specific risk factors, as summarized in Exhibit 1.

Exhibit 1: Factors Affecting Capital Structure



Determinants of the Amount and Type of Financing Needed

The total amount and type of financing needed (thus, the weightings in the WACC calculation) generally depend on the issuer's business model and its position in the corporate life cycle.

Capital-Intensive Businesses

Some businesses require a lot of assets—for example, those in utilities; transportation; real estate; some types of manufacturing, such as semiconductors; and natural resource production. These are known as **capital-intensive businesses**. This need for lots of assets is evident from low asset turnover (low sales-to-total-assets ratio), high capital expenditures to sales, and high net-working-capital-to-sales ratios.

While many businesses were once vertically integrated and more capital intensive, many have separated into multiple, focused companies where the capital-intensive business is separate from the customer-facing brand or service businesses. The businesses then have contractual rather than ownership relations. For example, Hilton Worldwide, one of the world's largest hotel companies, operates almost all its hotel rooms through long-term franchise or management agreements, with the hotels themselves owned by others. Similarly, NVIDIA designs and tests its products but does not manufacture semiconductor wafers; that capital-intensive activity is instead done by Taiwan Semiconductor Manufacturing Company Limited and Samsung Electronics Co. Ltd.

EXAMPLE 1**Leases as Debt Financing**

Many business models require fungible and tangible assets, such as

- office space,
- data centers,
- IT devices, such as PCs, phones, and tablets,
- aircraft, and
- automobiles.

While companies could buy these assets for cash or borrow cash and buy them, a more common approach is to lease them from a lessor, such as a bank or specialized asset lessor—for example, AerCap Holdings N.V., which leases over 1,000 aircraft to airlines.

A lease is like a loan, but rather than receiving cash in exchange for interest and principal payments, the borrower (lessee) receives an asset in exchange for lease payments. Implicit in the lease is an interest rate that is often much lower than what the lessee would have been lent cash for, because the leased asset is collateral and because lessors are often large companies that can borrow cheaply.

Another similar approach to financing fungible and tangible assets is through secured debt. By using the asset as collateral for a loan or bond, the issuer may be able to obtain a far lower cost of debt than on an unsecured basis. This is true of a downtown office building but probably not for a highly specialized factory in a remote location or a consumable asset that has little value to investors as collateral.

The capital structures of some firms can be regulated by governments. For example, banks must adhere to regulatory capital standards by maintaining a certain percentage of equity as a proportion of assets. Similarly, regulatory oversight of public utility companies by local governments can influence their capital structures through rules and regulations relating to setting pricing/rates. This generally increases WACC because it results in higher equity financing.

“Capital-Light” Businesses

Some business models—notably in the technology sector, as well as service businesses that have shed their capital-intensive businesses—have low capital needs (i.e., high fixed asset turnover and/or low capital-expenditures-to-sales-ratios), known as **capital-light businesses**, or asset-light businesses. Their assets might be primarily composed of excess cash and some intangibles. This reflects several factors:

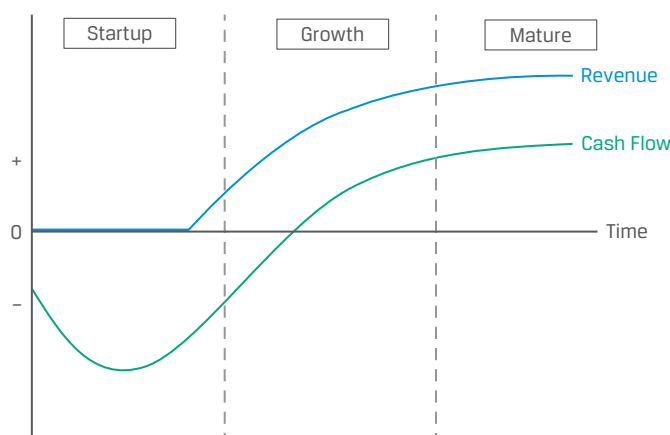
- They simply operate a network for others that own assets and thus do not need to seek financing for them from financial markets. For example, Uber and Airbnb operate global ridesharing and hospitality networks, respectively, that connect drivers and hosts who own the automobile and real estate assets with riders and guests. The companies earn commissions and fees from network users.
- The company may charge its customers upfront for services or have a very short or negative cash conversion cycle, thus obviating the need for external financing for working capital.

- The company may compensate employees and management primarily with stock, which the employees and management are happy to accept based on a rising stock price, again obviating the need for cash. This is technically a form of equity financing, but from employees rather than formal financial markets.
- If the company is profitable from an early stage and is capital light, it may not need to raise significant external financing unless management intends to expand quickly.

Corporate Life Cycle

Besides the business model determining the amount of financing needed, a large determinant of the type of financing (debt versus equity) used is based on the company's life cycle stage. Rather than a static capital structure, most firms have a capital structure that changes over time. The framework in Exhibit 2 describes the relationship between a company's life cycle stage, its cash flow characteristics, and its ability to support debt.

Exhibit 2: Capital Structure and Company Life Cycle



Feature / Phase	Startup	Growth	Mature
Revenue Growth	Initial	Rising	Slowing
Free Cash Flow	Negative	Rising	Stable
Business Risk	High	Medium	Low
Debt Availability	Little or None	Rising	High
Debt Type	Convertible	Secured	Unsecured

As companies mature, business risk typically declines and a firm's cash flows turn positive and stabilize, allowing for greater use of debt financing on better terms and at lower cost. Note that the framework considers free cash flow, which is net of capital investment. Profitable, high-growth businesses may have negative free cash flow once greater investments are considered. While the life cycle stages of a company often mirror those of an industry, both startup and growth companies can often be found in mature industries. Examples include restaurants and apparel, with new concepts, formats, and fashions appearing regularly, as well as technology-driven disruption of established industries, such as advertising (TikTok and Douyin), retail (Shopify), and automobiles (Tesla and BYD).

Early Stage/Startup

- Early in its life, a company requires funding to develop and launch its first product or service. Revenues are zero or minimal, and the risk of business failure is high. The uncertain prospects and negative free cash flow lead most startups to seek equity rather than debt financing. Many stock exchanges have minimum size and profitability requirements and costly regulatory requirements, so equity financing for startups is usually sourced from founders, employees, and venture capital investors rather than through an IPO.
- At this early stage, the only types of debt financing that might be available are leases and convertible debt. Leased assets commonly include office or retail real estate that can be leased at a low cost. Second, in some cases, startups may be able to raise **convertible debt**, or debt that offers investors the right to convert the debt to equity in the future at a predetermined price, while usually deferring interest payments until maturity. Convertible debt and other instruments combining debt and equity features are covered later in the curriculum.

Growth

- As a company emerges from the startup stage, product demand may result in rising revenue and accelerating growth, but further investment is needed to support growth and build scale. This includes sales and marketing expenses, growth-related capital expenditures, and working capital. Free cash flow is still likely negative, but visibility is improving as the firm establishes its customer and supplier base.
- As business risk declines and free cash flow improves, the business becomes more attractive to lenders. Many growth companies use debt conservatively to preserve operational and financial flexibility and minimize the risk of financial distress. Equity remains the predominant source of financing.

Mature Phase

- As a firm reaches maturity, revenue growth slows but also becomes more predictable. A mature firm usually generates reliable and positive free cash flow and likely has an established customer and supplier base. There is typically a decline or a deceleration in growth-related investment spending. Consistent free cash flow allows the company to borrow more cheaply, which is usually more attractive than higher-cost equity.
- In practice, large, mature public companies commonly use significant debt in their capital structures, although many seek to maintain an investment-grade credit rating to preserve maximum financial flexibility and minimize the cost of debt. Mature companies may elect to distribute capital to shareholders by increasing dividends or repurchasing shares.

Determinants of the Costs of Debt and Equity

The costs of debt and equity are determined in financial markets by top-down factors that affect debt and equity markets generally, as well as investors' assessments of issuer-specific factors. While the cost of debt is lower than the cost of equity, these costs are influenced by the same risk factors and thus tend to move together because they are claims on the same cash flows.

Top-Down Factors

Top-down factors affecting the cost of capital include financial market conditions and industry conditions.

Economic conditions can significantly influence debt and equity investors' expected returns, whether in private or public markets. Debt investors can invest on a nearly risk-free basis in sovereign government debt and will demand a spread over that as compensation for assuming the issuer-specific risks. Macroeconomic and country-specific factors (real growth, inflation, monetary policy, and exchange rate changes) can increase both interest rates on sovereign governments debt and credit spreads across issuers. As recession risk increases, debt investors may charge borrowers much higher spreads, owing to the increasing possibility of default. This effect is often more pronounced among firms in cyclical sectors, such as mining, materials, or industrials, in which revenues and cash flows vary widely through the economic cycle. The same is true for equity investors; companies ideally want to borrow when interest rates are low, and they want to issue equity when stock prices are high. This tends to follow the same conditions as when credit spreads are low.

The industry in which a firm operates is likely to have a significant effect as well. Exposure to economic factors is generally based on the products or services the issuer sells. For example, higher oil prices might lead to lower credit spreads and greater investor willingness to increase financial leverage for oil producers, while the opposite may happen for airlines, for which fuel is a significant expense.

Issuer-Specific Factors

Debt and equity investors consider the risk and return profile of an issuer and adjust their required rates of return relative to base rates or broad averages by evaluating risk factors, including the following:

1. Sales risks
2. Profitability risks (operating leverage)
3. Financial leverage and interest coverage
4. Collateral/type of assets owned by the firm.

Investors are more confident, all else equal, in firms with stable, predictable, and growing revenues and so will extend financing at lower costs to these types of firms. This is generally the result of size and the characteristics of the firm's products and services. For example, established firms in the telecommunications or software industries have stable cash flow streams from recurring subscription-based revenues from many customers, so no single customer represents more than a small fraction of total revenues. In contrast, such industries as automobile and construction equipment manufacturing have more volatile cash flows that are highly sensitive to economic conditions, increasing the risk of default should business conditions worsen.

Besides stability of revenues, stability of profit margins is also an important factor, which is determined by a company's proportion of fixed versus variable costs. This is often measured using a firm's **operating leverage**, or its proportion of fixed costs to total costs:

$$\text{Operating leverage} = \text{Fixed costs} / \text{Total costs.} \quad (2)$$

Companies with higher operating leverage experience a greater change in cash flow and profitability for a given change in revenue than firms with low operating leverage, as shown in the following example.

KNOWLEDGE CHECK: FIXED VS. VARIABLE COST AND FIRM PROFITABILITY


Consider two companies fully financed by equity. Each firm has revenue of 100 over a particular period and expenses of 70.

- The first company (Firm_{FC+}) has fixed costs (*FC*) of 50 and variable costs (*VC*) equal to 20% of sales, or 20.
- The second company (Firm_{FC-}) has fixed costs of 20 and variable costs equal to 50% of sales.

1. Calculate profit (revenue – total costs) for each firm, and compare their returns on equity (profit/total equity).

Solution:

Solve for profit by subtracting fixed costs (*FC*) and variable costs from revenue and dividing the profit by total equity to calculate the one-period return on equity:

Firm _{FC+} (Primarily Fixed Cost)		Firm _{FC-} (Primarily Variable Cost)	
Revenue	100	Revenue	100
Less: Fixed Costs	–50	Less: Fixed Costs	–20
Variable Cost (20%)	–20	Variable Cost (50%)	–50
Profit	30	Profit	30
Total Equity	100	Total Equity	100
Return on Equity	30%	Return on Equity	30%

2. Calculate the return on equity (ROE) for each firm if both firms experience a 25% increase in sales.

Solution:

Firm _{FC+} (Primarily Fixed Cost)	25% Sales Decline	Base Case	25% Sales Rise
Revenue	75	100	125
Less: Fixed Costs	50	50	50
Variable Cost (20%)	15	20	25
Profit	10	30	50
Total Equity	100	100	100
Return on Equity	10%	30%	50%

Firm _{FC-} (Primarily Variable Cost)	25% Sales Decline	Base Case	25% Sales Rise
Revenue	75	100	125
Less: Fixed Costs	20	20	20
Variable Cost (50%)	37.5	50	62.5
Profit	17.5	30	42.5

Firm_{FC-} (Primarily Variable Cost)	25% Sales Decline	Base Case	25% Sales Rise
Total Equity	100	100	100
Return on Equity	18%	30%	43%

3. Calculate the ROE for each firm if both firms experience a 25% decrease in sales.

Solution:

Firm_{FC+} (Primarily Fixed Cost)	25% Sales Decline	Base Case	25% Sales Rise
Revenue	75	100	125
Less: Fixed Costs	50	50	50
Variable Cost (20%)	15	20	25
Profit	10	30	50
Total Equity	100	100	100
Return on Equity	10%	30%	50%

Firm_{FC-} (Primarily Variable Cost)	25% Sales Decline	Base Case	25% Sales Rise
Revenue	75	100	125
Less: Fixed Costs	20	20	20
Variable Cost (50%)	37.5	50	62.5
Profit	17.5	30	42.5
Total Equity	100	100	100
Return on Equity	18%	30%	43%

4. Which firm might debt investors be willing to extend credit to at a lower cost of debt? Explain your answer.

Solution:

Based on the information provided, debt investors might be willing to extend credit at a lower cost of debt to Firm_{FC-} because its profits and profitability are more stable, especially in the downside case of a 25% decline in sales. The firm's stability of profits makes it more likely than Firm_{FC+} to be able to make promised interest and principal payments even if sales decline. The stability of profits results from a higher percentage of costs that are variable; in other words, it has lower operating leverage.

In practice, debt investors would, among other things, evaluate the stability of sales and develop an outlook for sales growth for both firms. While Firm_{FC-} has lower operating leverage, it could have greater sales risk than Firm_{FC+}.

Financial leverage and interest coverage are important considerations because a company with significant indebtedness already is less able to support *incremental* debt because it has already committed to interest and principal payments. Additionally, for equity investors, high levels of indebtedness mean that there are significant priority claims ahead of them. Financial leverage, covered in a prior lesson, is often measured

using a ratio of either total debt or debt net of cash and marketable securities to a profit measure, such as operating income, or to total equity. Interest coverage measures an issuer's ability to make interest payments from its core business profits:

$$\text{Interest coverage} = \text{Profit before interest and taxes} / \text{Interest expense.} \quad (3)$$

KNOWLEDGE CHECK: FINANCIAL LEVERAGE AND FIRM PROFITABILITY



Consider two companies both with assets of 100.

- Firm A is financed with 80 in equity and 20 in debt, while Firm B is financed with 40 equity and 60 debt.
- Each firm has revenue of 100 over a particular period and non-interest expenses of 70. Firm A has interest expense of 2, while Firm B has interest expense of 9. Ignore income taxes.

1. Calculate profit, interest coverage, and ROE for each firm.

Solution:

Firm A (Majority Equity)		Firm B (Majority Debt)	
Revenue	100	Revenue	100
Less: Operating expenses	-70	Less: Operating expenses	-70
Operating income	30	E	30
Less: Interest expense	-2	Less: Interest expense	-9
Interest coverage	15	Interest coverage	3.3
Profit	28	Profit	21
Total Equity	80	Total Equity	40
Return on Equity	35%	Return on Equity	53%

2. Calculate ROE and interest coverage for each firm if both experience a 25% increase in operating income.

Solution:

Firm A (Majority Equity)	25% OI Decline	Base Case	25% OI Rise
Operating income	22.5	30	37.5
Less: Interest expense	-2	-2	-2
Interest coverage	11	15	19
Profit	20.5	28	35.5
Total Equity	80	80	80
Return on Equity	26%	35%	44%

Firm B (Majority Debt)	25% OI Decline	Base Case	25% OI Rise
Operating income	22.5	30	37.5
Less: Interest expense	-9	-9	-9

Firm B (Majority Debt)	25% OI Decline	Base Case	25% OI Rise
Interest coverage	2.5	3.3	4.2
Profit	13.5	21	28.5
Total Equity	40	40	40
Return on Equity	34%	53%	71%

3. Calculate ROE and interest coverage for each firm if both experience a 25% decrease in operating income.

Solution:

Firm A (Majority Equity)	25% OI Decline	Base Case	25% OI Rise
Operating income	22.5	30	37.5
Less: Interest expense	−2	−2	−2
Interest coverage	11	15	19
Profit	20.5	28	35.5
Total Equity	80	80	80
Return on Equity	26%	35%	44%

Firm B (Majority Debt)	25% OI Decline	Base Case	25% OI Rise
Operating income	22.5	30	37.5
Less: Interest expense	−9	−9	−9
Interest coverage	2.5	3.3	4.2
Profit	13.5	21	28.5
Total Equity	40	40	40
Return on Equity	34%	53%	71%

4. Which firm might investors require lower rates of return for on debt and equity? Explain your answer.

Solution:

Firm A, which is primarily financed with equity. While Firm B has greater profitability (ROE) in the base case and higher upside for equity investors if operating income increases, it has a much wider range of outcomes owing to its substantially higher leverage. Even in the downside case, Firm A's interest coverage ratio is over 10; therefore, it can withstand a >90% decline in operating income before its ability to make interest payments is seriously imperiled.

In practice, investors would, among other things, evaluate the stability of sales and operating leverage in developing an outlook for both firms. So while Firm A has lower financial leverage and higher interest coverage, it could have greater operating leverage and higher sales risk than Firm B.

Finally, the underlying assets associated with a firm's business model are also an important consideration. In general, assets that support the greater use of debt include those that are considered strong collateral, generate cash, or are fungible or liquid, such as real estate, automobiles, aircraft, and receivables from creditworthy customers. Secured debt and leases are covered in detail later in the curriculum.

QUESTION SET



1. Match each of the following phases of the company life cycle with the debt type:

Phase of company life cycle	Likely debt type
A. Startup	i. Unsecured
B. Growth	ii. Convertible
C. Mature	iii. Secured

Solution:

- A.** ii. Convertible: In the early stages of the corporate life cycle, the only types of debt available are leases and convertible debt.
- B.** iii. Secured: Business risk declines and free cash flow improves in the growth phase but is still likely negative, so secured debt financing is most likely.
- C.** i. Unsecured: Free cash is now positive and predictable. The firm is able to use a significant amount of debt, including unsecured debt.

2. The cost of debt and equity is likely to be higher for a firm with

- A.** stable revenue growth.
- B.** high operating leverage.
- C.** high interest coverage.

Solution:

B is correct. Operating leverage is the firm's proportion of fixed costs to total costs and measures the stability of profits. Firms with high operating leverage experience a greater change in operating profits for a given change in revenues. Thus, firms with high operating margins are riskier and likely to have higher debt and equity costs.

A and C are incorrect. Stable revenue growth and high interest coverage suggest a lower risk profile for the firm and a lower cost of debt and equity.

A high interest coverage ratio indicates the firm has lower financial leverage and less risk.

Jason Jayman, a financial analyst, is preparing a report on two companies. Newtech is an early-stage company with a primarily variable operating cost structure, and its assets are largely cash and intangibles. Oldtech is a mature company with high fixed costs, low capital turnover, and a high capital expenditure to sales ratio. Jayman expects GDP growth to slow over the next year, which will lower the growth rate of revenues for both companies.

3. Newtech will likely finance activity by issuing:

- A.** unsecured debt.
- B.** equity through an IPO.

C. equity sourced from founders and employees.

Solution:

C is correct. Newtech is in the early stages of its corporate life cycle. Equity financing for early-stage firms is sourced from founders, employees through share-based compensation, and venture capital. Generally, the only sources of debt financing available for these firms are leases and convertible debt. Equity financing through an IPO is unlikely given that most stock exchanges have minimum size and profitability requirements.

4. Given the forecast of deteriorating business conditions, which company will experience a greater change in cash flow and profitability?

A. Newtech

B. No difference

C. Oldtech

Solution:

C. is correct. With revenue growth slowing, Oldtech is likely to experience a greater change in cash flow and profitability. Despite being in the mature phase of the corporate life cycle, during which one would expect stable profits, Oldtech has high operating leverage given its high degree of fixed cost. This will result in a greater change in profits for a given change in revenues. In contrast, Newtech's costs are variable, with low operating leverage.

5. The business model used by Oldtech can best be described as:

A. capital light.

B. capital intensive.

C. contractual rather than ownership relationships.

Solution:

B is correct. Oldtech's business model can best be described as capital intensive given its high fixed costs, low capital turnover, and high capital-expenditure-to-sales ratio. The firm requires a lot of assets and has significant financing requirements. Newtech is capital light since most of its costs are variable and its assets are largely cash and intangibles.

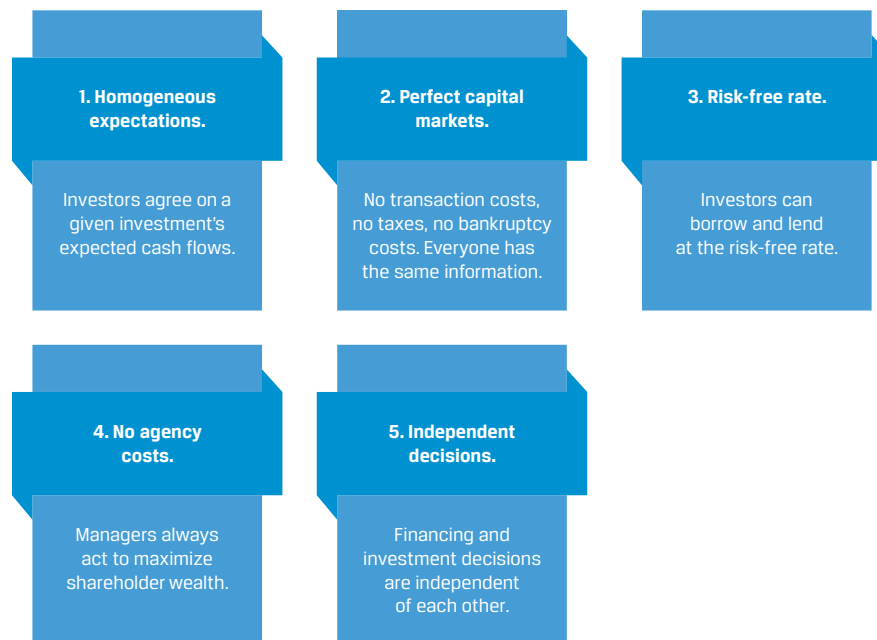
MODIGLIANI–MILLER CAPITAL STRUCTURE PROPOSITIONS

4



explain the Modigliani–Miller propositions regarding capital structure

In a classic 1958 paper, Nobel Prize–winning economists Franco Modigliani and Merton Miller argued that under certain assumptions, a company's choice of capital structure does not affect (or is "irrelevant" in determining) its value, where firm value is equal to the present value of the firm's expected future cash flows, discounted by its weighted-average cost of capital. In short, managers *cannot* change a company's value by simply changing its capital structure. The assumptions used by Modigliani and Miller (MM) are shown in Exhibit 3.

Exhibit 3: Modigliani–Miller Assumptions

Modigliani and Miller then relaxed their assumptions to show how taxes and financial distress costs *do* result in capital structure having an impact on firm value, though relatively modest in practice. While their assumptions do not hold in practice—which ultimately does alter MM's original conclusion of capital structure irrelevance—their theoretical framework remains a popular starting point for considering the use of debt in a company's capital structure. What is clear is that it's a firm's future cash flows that are the primary driver of value, not capital structure.

Capital Structure Irrelevance (MM Proposition I without Taxes)

Modigliani and Miller demonstrated that changing the capital structure does not affect firm value based on investors being able to create any capital structure they wish for a company by simply borrowing and lending themselves in addition to owning a firm's shares. This "homemade" leverage argument relies on the assumption that investors can lend and borrow at the risk-free rate.

Say, for example that a company has a capital structure consisting of 50% debt and 50% equity and that an individual investor would prefer that the company's capital structure be 70% debt and 30% equity. The investor could borrow money to finance her share purchases so that her ownership of company assets would reflect her preferred 70% debt financing. This action would be equivalent to buying stock on margin and would have no effect on either the company's expected operating cash flows or company value.

Modigliani and Miller used the concept of arbitrage to demonstrate their point: If the value of an unlevered company (i.e., a company without any debt) is not equal to that of a levered company, investors could make a riskless arbitrage profit at no cost by selling shares of the overvalued company and using the proceeds to buy shares of the undervalued company, forcing their values to become equal. The value of a firm is thus determined not by how it finances itself but, rather, by its expected future cash flows. Their conclusion is summarized next.

MM PROPOSITION I WITHOUT TAXES

If the market value of a company is not affected by the company's capital structure, then the following is true:

1. The value of the levered company (V_L) is equal to the value of the unlevered company (V_U), or $V_L = V_U$.
2. The value of a company is determined solely by its expected future cash flows (not its relative use of debt versus equity capital).
3. In the absence of taxes, the weighted-average cost of capital is unaffected by capital structure.

Higher Financial Leverage Raises the Cost of Equity (MM Proposition II without Taxes)

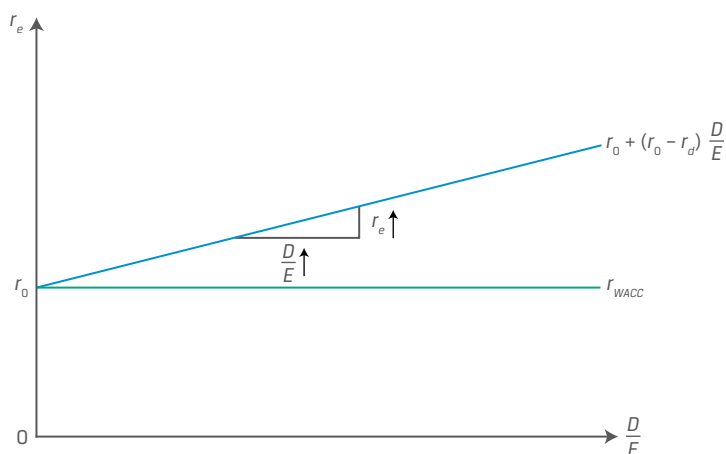
Debt is less costly than equity because debtholders have a priority claim. Therefore, one might expect a company's WACC to *decline* by increasing the proportion of debt in its capital structure. However, adding financial leverage increases risk, because more debt increases the probability of bankruptcy. As a result, equity investors will demand a higher return on equity to offset the increase in risk.

MM Proposition II without taxes tells us that adding any amount of lower-cost debt capital to the capital structure is always perfectly offset by an increase in the cost of equity, resulting in *no* change in the company's WACC. MM Proposition II explains why investors require higher returns on levered equity; their required returns should match the increased risk from leverage. Specifically, MM Proposition II without taxes implies that a firm's equity cost is a linear function of its debt-to-equity ratio (D/E):

$$r_e = r_0 + (r_0 - r_d) \frac{D}{E}, \quad (4)$$

where r_e is the cost of equity, r_0 is the cost of capital for a company financed *only* with equity, r_d is the cost of debt, D is the market value of debt, and E is the market value of equity. Exhibit 4 shows this relationship.

Exhibit 4: Equity Cost as a Function of the Debt-to-Equity Ratio



Note that r_e increases with the debt-to-equity ratio with an intercept equal to r_0 and slope equal to the quantity $(r_0 - r_d)$, while the WACC (r_{WACC}) does not change as debt levels change.

Given that capital structure changes do not affect the company's future cash flow stream and the company's weighted-average cost of capital remains unchanged for any chosen capital structure, there is no change in the value of the company. Note that Modigliani and Miller did not assume away the possibility of bankruptcy but simply assumed it occurs at zero cost.

MM PROPOSITION II WITHOUT TAXES

If the cost of equity is assumed to be a linear function of the company's debt-to-equity ratio, then the following is true:

1. Higher leverage raises the cost of equity but does not change firm value or WACC.
2. The increase in the cost of equity must exactly offset the greater use of lower-cost debt.

EXAMPLE 2

Gerhardt Corporation Cost of Equity

Assume that Gerhardt Corporation has an all-equity capital structure. Gerhardt has expected annual cash flows (or CF_e) of EUR5,000 and a cost of equity of 10%, which is also its WACC since equity is the firm's only source of capital. For simplicity, we assume that all cash flows are perpetual. Therefore, Gerhardt's value is equal to

$$V = \frac{CF_e}{r_{wacc}} = \frac{\text{EUR}5,000}{0.10} = \text{EUR}50,000.$$

Now suppose that Gerhardt plans to issue EUR15,000 in debt at a cost of 5% and use the proceeds to buy back and reduce its outstanding equity by EUR15,000. This action leaves total invested capital unchanged at EUR50,000.

Under MM Proposition I, $V_L = V_U$, the value of Gerhardt must remain the same at EUR50,000 after the change in capital structure. Under MM Proposition II, after the change in capital structure, the cost of equity for Gerhardt—now with EUR15,000 in debt capital and EUR35,000 in equity capital—increases to 12.143%:

$$r_e = 0.10 + (0.10 - 0.05) \frac{\text{EUR}15,000}{\text{EUR}35,000} \approx 0.12143 = 12.143\%.$$

To prove that Gerhardt's firm value is unchanged under the new capital structure, we must show its WACC remains unchanged at 10%. With the new cost of equity, Gerhardt's WACC is now calculated as

$$r_{wacc} = \left(\frac{\text{EUR}15,000}{\text{EUR}50,000} \right) 0.05 + \left(\frac{\text{EUR}35,000}{\text{EUR}50,000} \right) 0.12143 = 0.10 = 10\%.$$

Gerhardt's WACC is still 10%, because the move to lower-cost debt was perfectly offset by an increase in the cost of equity. Thus, consistent with MM Proposition I, the value of the firm remains unchanged, at EUR50,000. Furthermore, the value of Gerhardt must equal the sum of the present values of cash flows to debtholders (CF_d) and shareholders (CF_e). With EUR15,000 debt at a cost of 5% (r_d), Gerhardt makes the following debtholder and shareholder payments:

$$CF_d = D \times r_d.$$

$$\text{EUR}750 = \text{EUR}15,000 \times 5\%.$$

This leaves $\text{EUR}5,000 - \text{EUR}750 = \text{EUR}4,250$ remaining for shareholders (CF_e). Therefore, the total value of the company can also be expressed as

$$V = D + E$$

$$V = \frac{CF_d}{r_d} + \frac{CF_e}{r_e}$$

$$V = \frac{\text{EUR}750}{0.05} + \frac{\text{EUR}4,250}{0.12143} = \text{EUR}50,000.$$

Firm Value with Taxes (MM Proposition II with Taxes)

In most jurisdictions, interest expense is deductible from a company's income for tax purposes. In other words, debt provides a tax shield for companies that are earning profits, and the money saved in taxes enhances the value of the company. Ignoring other factors, such as the costs of financial distress and bankruptcy, for now, let us explore the two MM propositions when we relax the assumption of no corporate taxes.

The value of the company increases with increasing levels of debt, and the actual cost of debt is reduced by the amount of the tax benefit:

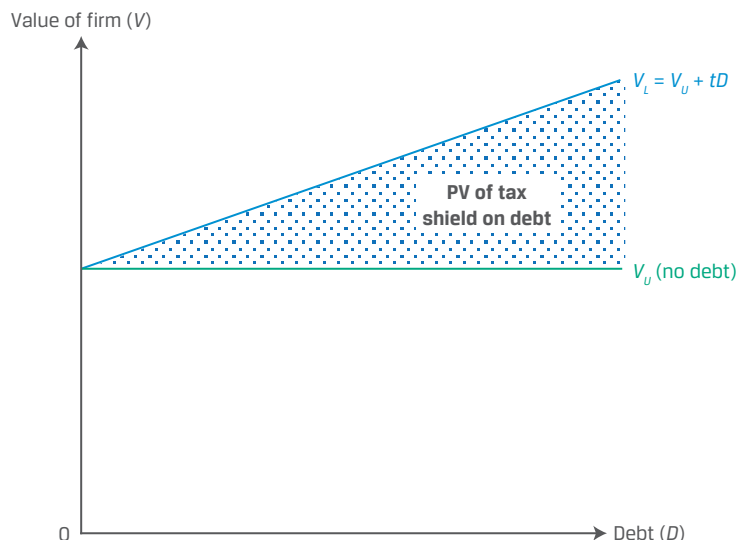
$$\text{After-tax cost of debt} = \text{Before-tax cost of debt} \times (1 - \text{Marginal tax rate}).$$

Modigliani and Miller's Proposition I with corporate taxes states that in the presence of corporate taxes (but not personal taxes), the value of the levered company is greater than that of the all-equity company by an amount equal to the tax rate multiplied by the value of the debt (tD), defined as the present value of the **debt tax shield**:

$$V_L = V_U + tD, \quad (5)$$

where t is the marginal tax rate and tD is the present value of the debt tax shield. When there are corporate taxes, a profitable company can increase its value by using debt financing, as shown in Exhibit 5.

Exhibit 5: Firm Value with Corporate Taxes and Debt



As noted in Proposition I with corporate taxes, the increase in firm value, V , is solely attributable to the tax shield. Taken to its (unrealistic) extreme, Equation 5 predicts a value-maximizing capital structure of 100% debt.

MM PROPOSITION I WITH CORPORATE TAXES

If the market value of a levered company is equal to the value of an unlevered company plus the value of the debt tax shield, then the following is true:

1. In the presence of taxes, a profitable company can increase its value (V) by using debt.
2. The higher the tax rate, the greater the benefit of using debt in the capital structure.

Cost of Capital (MM Proposition II with Taxes)

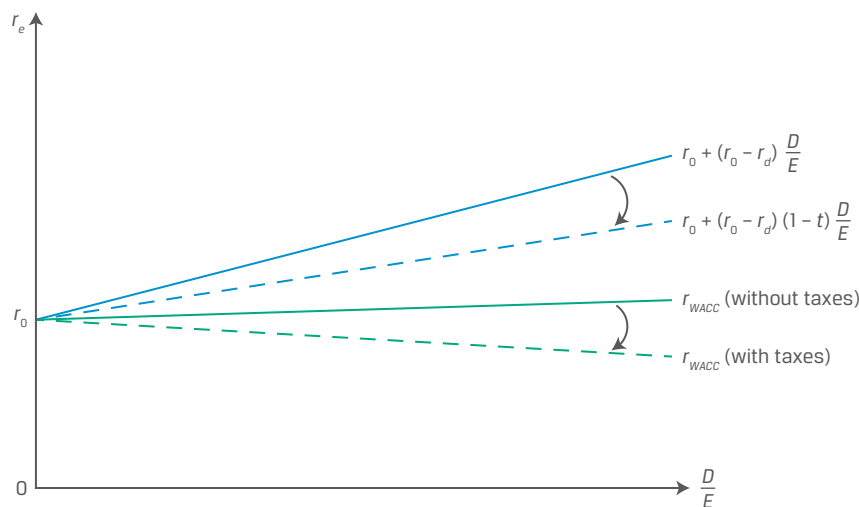
If the value of the company increases as it uses more debt, the company's WACC must decrease as it uses more debt. That is, in the earlier propositions without corporate taxes, the lower cost of debt was fully offset by an increase in the cost of equity. Now, in the presence of corporate taxes, the cost of debt is further lowered by the tax benefit such that the lower debt cost outweighs the increase in the cost of equity and results in a lower WACC.

To demonstrate this idea, let's begin with the revised cost of equity under MM Proposition II with corporate taxes:

$$r_e = r_0 + (r_0 - r_d)(1 - t)\frac{D}{E}. \quad (6)$$

Notice that the only difference between Equation 6 and Equation 4 (MM Proposition II with no taxes) is the presence of the term $(1 - t)$. When t is zero, the two equations are identical. When t is not zero, the term $(1 - t)$ is less than 1 and serves to reduce the cost of levered equity. The cost of equity still rises as the company increases the amount of debt in its capital structure, but it rises at a slower rate than in the no-tax case, as shown in Exhibit 6.

Exhibit 6: Equity Cost, Debt-to-Equity Ratio, and WACC with Taxes



Consequently, as debt increases, the company's r_{WACC} decreases and the company's value increases. This result implies that when there are taxes (and no financial distress or bankruptcy costs), debt financing is highly advantageous. Taken to an extreme, this result also suggests that a company's optimal capital structure is 100% debt—a conclusion that is at odds with reality and a direct result of Modigliani and Miller's restrictive assumptions.

MM PROPOSITION II WITH CORPORATE TAXES

If the cost of equity is a linear function of the company's debt-to-equity ratio with an adjustment for the tax rate, then the following is true:

1. In the presence of taxes, the cost of equity rises as the company uses more debt but at a slower rate than in the no-tax case.
2. As the company's use of debt increases, its WACC decreases and its value increases.
3. In the presence of taxes (but no financial distress or bankruptcy costs), the use of debt is value enhancing and, at the extreme, 100% debt is optimal.

EXAMPLE 3

Gerhardt Corporation under Corporate Taxes

Recall from the previous example that annual cash flows to Gerhardt shareholders were EUR5,000 and the cost of equity (and WACC) was 10%. As before, Gerhardt is planning to issue EUR15,000 of 5% debt to buy back an equivalent amount of equity. Now, however, assume that Gerhardt pays corporate taxes at a rate of 25%.

Since the company does not currently have debt, the after-tax cash flows are now $\text{EUR}5,000(1 - 0.25)$, or EUR3,750. Because the cash flows are assumed to be perpetual, the value of the company is EUR37,500 ($= \text{EUR}3,750/0.10$), considerably less than the amount when there were no corporate taxes, EUR50,000.

Now, suppose Gerhardt proceeds to issue EUR15,000 of debt and uses the proceeds to repurchase equity. According to MM Proposition II with corporate taxes (i.e., Equation 5), the value of the company is

$$V_L = V_U + tD = \text{EUR}37,500 + 0.25(\text{EUR}15,000) = \text{EUR}41,250.$$

The total company value is now EUR41,250, consisting of debt of EUR15,000 and equity of EUR26,250 ($= \text{EUR}41,250 - \text{EUR}15,000$).

According to MM Proposition II with corporate taxes (Equation 6), the new cost of equity for Gerhardt is

$$r_e = 0.10 + (0.10 - 0.05)(1 - 0.25)\frac{\text{EUR}15,000}{\text{EUR}26,250} = 0.12143 = 12.143\%.$$

Using this new cost of equity, we can compute the new WACC:

$$\begin{aligned} r_{wacc} &= \frac{\text{EUR}15,000}{\text{EUR}41,250}(0.05)(1 - 0.25) + \frac{\text{EUR}26,250}{\text{EUR}41,250}(0.12143) \\ &= 0.09091 = 9.091\%. \end{aligned}$$

Unlike the previous example, where Gerhardt's WACC did not change with the change in capital structure, Gerhardt's WACC decreased in this example from 10% to 9.091%. This reduction in WACC resulted in an increase in company value to EUR41,250:

$$V_L = \frac{CF_e(1-t)}{WACC} = \frac{\text{EUR}5,000(1-0.25)}{0.09091} \approx \text{EUR}41,250.$$

As shown in the previous example, the value of the company must also equal the present value of cash flows to debtholders and shareholders:

$$V_L = D + E = \frac{r_d D}{r_d} + \frac{(CF_e - r_d D)(1-t)}{r_e}$$

$$V = \frac{\text{EUR}750}{0.05} + \frac{(\text{EUR}5,000 - \text{EUR}750)(1-0.25)}{0.12143} \approx \text{EUR}41,250.$$

Of course, in the real world, taxes are not the only factor affecting the value of a levered company. The analysis becomes more complex when we consider the costs of financial distress, among other real-world considerations.

Cost of Financial Distress

Financial distress refers to the heightened uncertainty regarding a company's ability to meet its obligations because of diminished earnings power or actual current losses. Operating and financial leverage can magnify profits but also increase losses and the likelihood of financial distress. Even before filing for bankruptcy, companies under financial distress may lose customers, creditors, suppliers, and employees.

Direct costs of financial distress are cash expenses associated with bankruptcy, such as legal and administrative fees, while indirect costs include forgone business and investment opportunities, reputational risk, and costs arising from conflicts of interest between managers and debtholders, or agency costs of debt, when a firm is near or in bankruptcy.

Costs of financial distress are lower for firms whose assets have a ready secondary market. Airlines, shipping companies, and some manufacturers have tangible assets that can be easily sold. Technology, pharmaceutical, and information technology firms, as well as those in the service sector, usually lack such assets and have higher costs associated with financial distress. The probability of financial distress and bankruptcy rises with more debt in the capital structure, higher sales risk and operating leverage, and lower liquidity. The task of optimizing a firm's capital structure by taking these and other factors into consideration is the subject of the next lesson.

EXAMPLE 4

The Costs of Financial Distress

Rite Aid Corporation, listed on the NYSE, operates over 2,000 retail pharmacies in the United States. The company has a highly leveraged balance sheet, with a ratio of net debt to annual earnings before interest, taxes, depreciation, and amortization over 5.0 for many years. During the COVID-19 pandemic, the company performed well, exceeding profit expectations largely due to brisk COVID-19 testing and vaccine revenues. However, as the pandemic entered its third year, vaccine and testing revenue began to fall, and other issues, such as pricing declines from insurance companies and wage pressures, accelerated. Owing to its high financial leverage, the ensuing reduction in analysts' profit estimates resulted in large declines in the prices of Rite Aid debt and equity: Over the first five months of 2022, the price of its 02/15/2027 unsecured notes fell from 94 to 60 and its stock price fell from \$15 to \$6 per share. By May 2022, Rite Aid's cost of debt exceeded 20%.

In April 2022, one equity analyst lowered the estimated fair value of Rite Aid stock from \$16 to \$1 and warned that the stock may in fact be worthless. According to the analyst, the company faced \$200 million per year in interest

expenses and another \$225 million per year in maintenance capital expenditures. The analyst estimated that next fiscal year, the company would achieve only \$370 million in earnings before interest, taxes, depreciation, and amortization, and the analyst warned that it faces considerable challenges in growing beyond that. Continued net losses would render the stock worthless and likely require the company to restructure its obligations with its bondholders.

During its quarterly earnings call, management was upbeat, but it intends to close 145 underperforming stores to lower its expenses and further cut corporate costs to improve profitability.

QUESTION SET



1. The view that debt financing is highly advantageous and the optimal capital structure is 100% debt is consistent with:

- A. MM without taxes.
- B. MM with taxes and financial distress costs.
- C. MM with taxes and no financial distress cost.

Solution:

C is correct. MM with taxes and no distress cost leads to the conclusion that the optimal capital structure is 100% debt. This is because tax law favors debt financing over equity financing since the interest expense on debt financing is tax deductible. Ignoring financial distress costs, the value of the company increases with increasing levels of debt. The value of the levered firm (V_L) is greater than that of the unlevered one (V_U) by the amount equal to the tax rate multiplied by the level of debt (tD).

2. True or False: What is clear from MM is that the primary driver of firm value is capital structure.

- A. True
- B. False

Solution:

B is correct. This statement is false since it is future cash flows that are the primary driver of value. Under a set of restrictive assumptions, MM's conclusion of capital structure irrelevance is obtained. Relaxing these assumptions, MM showed that capital structure does impact value, but it has only a modest impact compared to future cash flows.

3. MM Proposition II without taxes differs from MM Proposition I without taxes since it concludes that:

- A. WACC is unaffected by capital structure.
- B. the value of the levered firm is equal to that of the unlevered firm.
- C. higher leverage raises the cost of equity, which exactly offsets the lower cost of debt.

Solution:

C is correct. MM Proposition II without taxes differs from MM Proposition I without taxes in that the cost of equity will rise with leverage and completely offset the lower cost of debt. Debt has a lower cost relative to equity because debtholders have a priority claim on the cash flow of the firm. So, one would expect WACC to decline with more debt. MM Propo-

sition II without taxes argues that the cost of equity is a linear function of the debt-to-equity ratio. The addition of more low-cost debt to the capital structure will increase the debt-to-equity ratio and raise the cost of equity, offsetting the lower debt cost. As a result, the firm's WACC is unchanged.

Company Y has an unlevered WACC of 10%. It has a cost of debt equal to 5.5% and a debt-to-equity ratio of 0.75. The corporate tax rate is 25%.

4. Fill in the blanks: The cost of equity for Company Y will be _____ if it pays no corporate taxes and _____ if it pays corporate taxes.

Solution:

The cost of equity for Company Y will be 13.37% if it pays no corporate taxes and 12.53% if it pays corporate taxes.

The cost of equity is a linear function of its debt-to-equity ratio and without taxes is calculated as follows:

$$r_e = r_0 + (r_0 - r_d)\frac{D}{E}$$

$$= 10\% + (10\% - 5.5\%)(0.75) = 13.37\%.$$

The cost of equity with taxes is calculated as

$$r_e = r_0 + (r_0 - r_d)(1 - t)\frac{D}{E}$$

$$= 10\% + (10\% - 5.5\%)(1 - 0.25)(0.75) = 12.53\%.$$

5. If Company Y is an all-equity-financed firm, its cost of equity will be _____ its WACC.

- A. greater than
- B. equal to
- C. lower than

Solution:

B is correct. Since Company Y is an unlevered firm and has no debt in its capital structure, the cost of equity will be the same as WACC. Since the weighting of debt is zero, the WACC formula is simply WACC = Weighting of equity × Cost of equity.

5

OPTIMAL CAPITAL STRUCTURE



describe optimal and target capital structures

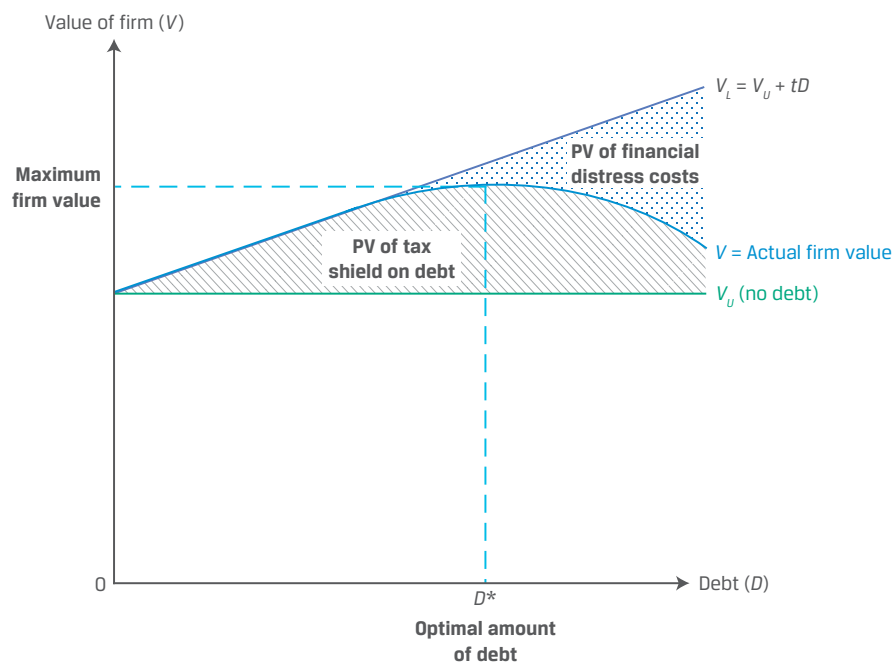
While the Modigliani–Miller propositions offer an initial framework for capital structure decisions, a company's managers facing capital structure choices must address trade-offs simultaneously while incorporating those factors outlined in prior lessons. For example, consider a more real-world-appropriate scenario with *both* corporate taxes and bankruptcy/financial distress costs. The value-enhancing effect of the tax shield from leverage is offset by the value-reducing impact of the present value of expected

(or probability-weighted) costs of financial distress or bankruptcy. We can show this trade-off by incorporating the potential cost of financial distress or bankruptcy into the value of a levered firm:

$$V_L = V_U + tD - PV(\text{Costs of financial distress}). \quad (7)$$

Equation 7 represents what is sometimes referred to as the **static trade-off theory of capital structure**, which is illustrated in Exhibit 7.

Exhibit 7: Static Trade-Off Theory of Capital Structure



V_U represents the value of an unlevered or all-equity firm. As debt is added to the capital structure, the new levered firm value is derived from Equation 7. At low debt levels, the tax benefit of debt usually outweighs potential financial distress costs, resulting in a higher firm value. However, as debt increases, the possible financial distress costs rise substantially and equal the tax benefit of debt at D^* . Beyond this point, greater leverage reduces firm value, and the present value of financial distress costs outweighs the tax benefit. The debt level corresponding to D^* , which maximizes firm value, and the associated level of equity are referred to as the **optimal capital structure**.

Managers cannot precisely estimate D^* in practice but, rather, establish a **target capital structure** based on these two considerations, as well as the internal and external factors outlined in earlier lessons. There are several reasons why a firm's actual capital structure may differ from its target. For example, management may exploit short-term opportunities in a particular financing source. A company able to issue debt at attractive rates, for instance, may borrow more than planned in response to strong investor demand. Also, changing market values of the company's debt and equity securities can cause the firm's actual capital structure to deviate from a target. Transaction costs and minimum deal sizes make it impractical for firms to constantly align capital structure to a specific number. As a result, firm managers usually set an optimal capital range: for example, 30%–50% debt rather than 40%.

While prior WACC calculations and debt and equity weights were made with the *market* value of equity and debt, target capital structure is often expressed using the *book* value of equity and debt for the following reasons:

1. *Market values can fluctuate substantially and seldom impact the appropriate level of borrowing.* On the contrary, a company whose share price has risen rapidly may take advantage of this by raising equity capital rather than debt to maintain a certain debt-to-equity ratio.
2. *For management, the primary concern is the amount and types of capital invested by the company, not in the company.* This perspective includes how working capital and capital projects will be funded. It differs from that of a shareholder who has purchased shares at the prevailing market price seeking a return on that investment.
3. *Capital structure policy is aligned to measures used by third parties.* Since lenders, debt investors, and rating agencies generally focus on the book value of debt and equity for their calculation measures, firm managers take this fact into account in determining their capital structure policies.

Although it is common for target capital structures to be expressed in terms of book values, managers pay close attention to the price and market interest rates on their equity and debt outstanding to gauge when to raise capital and how much and what type to raise.

Target Weights and WACC

In the first lesson, when computing WACC, we used the current market values of debt and equity to compute the weights. An alternative approach would be to use the target capital structure, especially if management discloses it. Independent analysts unaware of the firm's target may estimate it using one of several methods:

1. Assume the company's current capital structure, at market value weights for the components, represents the company's target capital structure.
2. Examine capital structure trends or management statements regarding capital structure policy to infer a company's target capital structure.
3. Use averages of comparable companies' capital structures as the target.

Note that a simple way of transforming a debt-to-equity ratio (D/E) into a weight—that is, $D/(D + E)$ —is to divide D/E by $1 + D/E$.

KNOWLEDGE CHECK ESTIMATING PROPORTIONS OF CAPITAL FOR GERHARDT CORPORATION



A financial analyst seeks to estimate Gerhardt Corporation's weighted-average cost of capital using the following information:

- Market value of debt: EUR50 million
- Market value of equity: EUR60 million

Primary competitors and their capital structures (in millions):

Competitor	Market Value of Debt	Market Value of Equity
A	EUR25	EUR50
B	EUR101	EUR190
C	GBP40	GBP60

1. Calculate the proportions of debt and equity for the WACC analysis using Gerhardt's current capital structure.

Solution:

Current capital structure:

$$w_d = \frac{\text{€50 million}}{\text{€50 million} + \text{€60 million}} = 0.4545.$$

$$w_e = \frac{\text{€60 million}}{\text{€50 million} + \text{€60 million}} = 0.5454.$$

2. Calculate the proportions of debt and equity for the WACC analysis using the capital structure of Gerhardt's competitors.

Solution:

Competitors' capital structure:

$$w_d = \frac{\left(\frac{\text{€25}}{\text{€25} + \text{€50}}\right) + \left(\frac{\text{€101}}{\text{€101} + \text{€190}}\right) + \left(\frac{\text{£40}}{\text{£40} + \text{£60}}\right)}{3} = 0.3601.$$

$$w_e = \frac{\left(\frac{\text{€50}}{\text{€25} + \text{€50}}\right) + \left(\frac{\text{€190}}{\text{€101} + \text{€190}}\right) + \left(\frac{\text{£60}}{\text{£40} + \text{£60}}\right)}{3} = 0.6399.$$

3. Calculate the proportions of debt and equity for the WACC analysis if Gerhardt announces that a debt-to-equity ratio of 0.7 reflects its target capital structure.

Solution:

A debt-to-equity ratio of 0.7 represents a weight on debt of $0.7/1.7 = 0.4118$, so $w_d = 0.4118$ and $w_e = 1 - 0.4118 = 0.5882$. These would be the preferred weights to use in a cost-of-capital calculation.

Pecking Order Theory and Agency Costs

Investors and issuers have **asymmetric information**. Issuer management has access to more information about its business and its prospects than is publicly available, and managers are likely to use this information to their advantage when seeking financing. Debt and equity investors demand higher returns from companies with higher information asymmetry because they may be concerned that new securities are overpriced; that is, a company will either issue equity when its shares are expensive or issue new debt when the firm's creditworthiness is about to deteriorate.

Since investors often closely watch manager behavior for insight into a company's prospects, managers consider what their actions might signal to outsiders. The signaling model of capital structure suggests a hierarchy (or pecking order) of methods for financing new investments.

The **pecking order theory**, developed by Stewart C. Myers and Nicholas S. Majluf in 1984, suggests that managers give first preference to financing methods with the least potential information content (internally generated funds) and last preference to methods with the most potential information content (public equity offerings). Public equity offerings often raise skepticism among investors because existing owners would seem less likely to want to share ownership of a company with strong future prospects. As a result, managers prefer internal financing, and if external financing is needed, they prefer private debt to public debt and prefer equity issuance least of all.

Another implication of the work of Myers and Majluf is that issuers tend to issue equity when management believes the stock is overvalued and are reluctant to issue equity if they believe the stock is undervalued, potentially choosing instead to

repurchase shares. Thus, additional issuance of equity, usually to finance an acquisition, is often interpreted by investors as a negative signal. The issuance of debt commits the company to future interest and principal payments, which (along with recurring dividends) may be interpreted as a sign of management confidence in the company's future ability to make such payments. These signals are considered too costly for poorly performing companies to afford.

Alternatively, the signal of issuing equity at the bottom of the pecking order holds other clues. If, for instance, the company's cost of capital increases after an equity issuance, we can interpret this effect as an indication that management needs capital beyond what comes cheaply; in other words, this is a negative signal regarding the company's prospects. Managers may hesitate to issue new equity when they believe the company's shares are underpriced, because they wish to avoid signaling that they believe the shares are overpriced and also to avoid the cost and effort involved with new equity issuance.

Agency costs were introduced in an earlier lesson as the incremental costs arising from conflicts of interest between managers, shareholders, and bondholders. In the case of capital structure decisions, savings in the agency costs of equity may arise with the increased use of debt. Similarly, the more financially leveraged a company, the less freedom for managers to either take on more debt or spend cash unwisely. This is the foundation of Michael Jensen's (1986) **free cash flow hypothesis**: Higher debt levels discipline managers by forcing them to manage the company efficiently and use cash wisely so the company can make its interest and principal payments.

EXAMPLE 5

Agency Costs, Asymmetric Information, and Signaling

CLP AG, a small, listed biopharmaceutical company, is conducting a clinical trial of its drug, which is already approved for treatment of an autoimmune disorder, to be used in a new application for which it was not originally intended: treatment of a type of viral infection. Management hopes this new application for the drug will result in a big increase in sales and the value of the company. The company has been consistently profitable and debt free. The following events occur:

- In July, management receives notice from the clinical trial investigators that results look promising. Anticipating that it might have to scale up production quickly, the company negotiates and announces a large increase in its credit line.
- In August, CLP announces successful test results by public press release. CLP shares increase by 35%.

Explain how asymmetric information and signaling are represented here.

1. Asymmetric information

Solution

Asymmetric information is represented by management's knowledge of the positive trial results in July, before they were publicly announced in August. Signaling is represented by the company's announcement in July that it was increasing its credit line. The announcement could reasonably be taken as a signal of management's confidence that the trial results will be positive and that the company will need to expand production capacity. This is true whether or not the signaling is intentional.

QUESTION SET



1. True or False: Under the pecking order theory, the firm has no optimal capital structure and a firm's capital structure reflects its historic need for external financing.

- A. True
B. False

Solution:

A is correct. The pecking order theory is based on asymmetric information held by investors and issuers and the idea that managers consider what their actions may signal to investors. The signaling model suggests a hierarchy in methods in financing the firm. Internal funds are used first, then debt is used, and finally, reluctantly, firms use equity. There is no optimal capital structure, and a firm's capital structure reflects its historic need for external financing.

2. Company Z announces that a debt-to-equity ratio of 1.2 is consistent with its target capital structure. Given this value, the weight for equity in the WACC calculation is:

- A. 45%.
B. 55%.
C. 83%.

Solution:

A is correct. A simple way of transforming a debt-to-equity ratio (D/E) into a weight—that is, $D/(D + E)$ —is to divide D/E by $1 + D/E$. Therefore, a debt-to-equity ratio of 1.2 represents a weight on debt of $1.2/2.2 = 0.5455$, so $w_d = 0.5455$ and $w_e = 1 - 0.5455 = 0.4545$. Thus, the weight for equity in the WACC calculation is 45%.

3. Match each of the following concepts on the left with a capital structure theory/hypothesis on the right:

Concepts	Capital Structure Theory/Hypothesis
1. Optimal capital structure	A. Free cash flow hypothesis
2. Agency costs	B. Pecking order theory
3. Asymmetric information	C. Static trade-off theory of capital structure

Solution:

- C. The static trade-off theory of capital structure determines the optimal capital structure.
- A. The free cash flow hypothesis is based on agency costs and the idea that higher debt levels impose discipline on managers to avoid perks and non-value-adding acquisitions.
- B. The pecking order theory is based on asymmetric information held by investors and issuers and the important role of signaling.

4. The value-reducing impact of financial distress or bankruptcy increases if the firm has:

- A. higher business risk.
- B. lower operating and financial leverage.
- C. assets with a ready secondary market.

Solution:

A is correct. The probability and cost of financial distress rise for firms with higher business risk and more debt in the capital structure. In contrast, the cost of financial distress is lower for firms with lower operating and financial leverage and for firms with assets that have a secondary market and can be easily sold.

5. True or False: The target capital structure should be estimated using the market value of equity and debt in calculating WACC.

- A. True
- B. False

Solution:

B is correct. Target capital structure is often estimated using book values because market values can fluctuate significantly and are unlikely to impact borrowing capacity. Issuers will often aim for a certain credit rating, such as investment grade, which is strongly influenced by the issuer's (book value) level of indebtedness relative to cash flows.

PRACTICE PROBLEMS

The following information relates to questions 1-4

A financial analyst is evaluating the capital structure for Boulder, Inc. Boulder, Inc., is a US-based unleveraged firm with a constant (perpetual) cash flow of \$6 million per year before taxes. The firm has a market value of \$45 million and a corporate tax rate of 30%. Boulder plans to issue \$15 million in debt to retire an equivalent amount of equity. The debt will have a cost of 5.5%.

The financial analyst notes that the tax shield advantage of debt is offset due to the risk of financial distress. He estimates the present value of the cost of financial distress at various debt levels as follows:

Value of Debt	Present Value of Cost of Distress
\$5 million	\$0.1 million
\$10 million	\$0.2 million
\$15 million	\$0.5 million
\$20 million	\$1.5 million
\$25 million	\$6.0 million
\$30 million	\$12.0 million

- The WACC of the unleveraged firm, prior to the debt issue, is closest to:
 - 4.00%.
 - 9.33%.
 - 13.33%.
- The use of the \$15 million of debt financing increases the value of Boulder by _____ over its unlevered value. Ignore the costs of financial distress.
 - \$4.5 million
 - \$10.5 million
 - \$15 million
- Including the present value of the cost of distress, the value of Boulder is closest to:
 - \$49 million.
 - \$55 million.
 - \$59.5 million.
- The level of debt that will maximize the value of Boulder Inc. is closest to:
 - \$15 million.

- B. \$20 million.
 - C. \$30 million.
-

5. A financial analyst is evaluating the capital structure for Plover, Inc., a European-based unleveraged firm with a constant (perpetual) cash flow of EUR10.0 million per year before taxes. The firm has a market value of EUR100.0 million and a corporate tax rate of 20%. Plover plans to issue EUR35.0 million in debt to retire an equivalent amount of equity, so the size of the firm will remain unchanged. The debt will have a cost of 4.5%. Assume the cost of financial distress is close to zero.

After the debt issuance and change in the capital structure, Plover's WACC is closest to:

- A. 5.47%.
- B. 7.48%.
- C. 8.82%.

SOLUTIONS

1. B is correct. The after-tax cash flows for the company are \$6 million $\times$ (1 – 0.30) = \$4.2 million. Since the cash flows are assumed to be perpetual, WACC is calculated as follows:

$$r_{WACC} = CF(1 - t)/V = \$4.2/\$45 = 9.33\%.$$

Since this is an all-equity firm, the cost of equity is equal to WACC.

2. A is correct. According to MM Proposition I with corporate taxes, the value of the levered company is greater than that of the unlevered company by an amount equal to the tax rate multiplied by the value of the debt (tD), defined as the present value of the debt tax shield.

$$V_L = V_U + tD = \$45 \text{ million} + 0.30(\$15 \text{ million}) = \$49.5 \text{ million}.$$

Thus, the use of debt financing will increase the value of Boulder by \$4.5 million over the unlevered firm. Note that the firm's value increases continuously as additional debt is added to the capital structure, and the optimal capital structure is 100% debt.

3. A is correct. With financial distress included, as debt is added to the capital structure, the levered value of the firm is given by:

$$V_L = V_U + tD - PV(\text{Costs of financial distress}).$$

The levered value of Boulder financed with \$15 million in debt is

$$V_L = \$45 \text{ million} + 0.30(\$15 \text{ million}) - \$0.5 \text{ million} = \$49 \text{ million}.$$

4. B is correct. With financial distress included, as debt is added to the capital structure, the levered value of the firm is given by:

$$V_L = V_U + tD - PV(\text{Costs of financial distress}).$$

The following shows calculations of the levered value of Boulder at various debt levels, in \$millions.

D	PV(Costs of financial distress)	$V_L = V_U + tD - PV(\text{Costs of financial distress}).$
5	0.1	$V_L = 45 + 0.3(5) - 0.1$ $V_L = 46.4$
10	0.2	$V_L = 45 + 0.3(10) - 0.2$ $V_L = 47.8$
15	0.5	$V_L = 45 + 0.3(15) - 0.5$ $V_L = 49$
20	1.5	$V_L = 45 + 0.3(20) - 1.5$ $V_L = 49.5$
25	6.0	$V_L = 45 + 0.3(25) - 6.0$ $V_L = 46.5$
30	12.0	$V_L = 45 + 0.3(30) - 12.0$ $V_L = 42$

Thus, the optimal amount of debt is \$20 million, which maximizes the value of Boulder at a level of \$49.5 million. Beyond \$20 million in debt, greater leverage

reduces the firm value because the present value of financial distress costs more than the offsetting tax benefit.

5. B is correct. The calculations to determine the WACC are as follows:

The after-tax cash flows for the company are EUR10.0 million $(1 - 0.20) = \text{EUR}8.0$ million. Since the cash flows are assumed to be perpetual, WACC for the unlevered firm is calculated as

$$r_{WACC} = CF(1 - t)/V = \text{EUR}8.0 \text{ million} / \text{EUR}100.0 \text{ million} = 8.0\%.$$

The market value of Plover with the debt financing is EUR107 million:

$$V_L = V_U + tD = \text{EUR}100.0 \text{ million} + 0.20(\text{EUR}35.0 \text{ million}) = \text{EUR}107.0 \text{ million}.$$

To find the cost of equity, we first need to find the market value of equity:

$$V_L = D + E, \text{ where } D \text{ and } E \text{ are market values of debt and equity, respectively.}$$

$$E = \text{EUR}107.0 \text{ million} - \text{EUR}35.0 \text{ million} = \text{EUR}72.0 \text{ million}.$$

The cost of equity is given by

$$\begin{aligned} r_e &= r_0 + (r_0 - r_d)(1 - t)\frac{D}{E} \\ &= 8.0\% + (8.0\% - 4.5\%)(0.80)(\text{EUR}35.0 \text{ million} / \text{EUR}72.0 \text{ million}) = 9.36\%. \end{aligned}$$

Plover's WACC is calculated as follows:

$$\text{WACC} = (\text{Weighting of debt} \times \text{Cost of debt}) + (\text{Weighting of equity} \times \text{Cost of equity})$$

$$= (\text{EUR}35 \text{ million} / \text{EUR}107.0 \text{ million})(4.5\%)(1 - 0.2) + (\text{EUR}72.0 \text{ million} / \text{EUR}107.0 \text{ million})(9.36\%)$$

$$= 7.48\%, \text{ which is lower than the } 8.0\% \text{ for the unlevered firm.}$$

LEARNING MODULE

7

Business Models

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe key features of business models
☐	describe various types of business models

INTRODUCTION

1

A clearly described business model helps the analyst understand a business: its strategy, operations, target markets, key customers, suppliers, and ultimately prospects, risks, and financial profile. Many firms have conventional business models that are easily understood and have long existed, such as manufacturers and retailers. However, many business models are complex, novel, or a combination of models. Technological innovation, particularly digitalization, has enabled significant business model innovation over the past decades. Analysts need to develop their own understanding of an issuer's business model to inform their outlook and risk assessment; analysts should not rely solely on management's description of its business model.

LEARNING MODULE OVERVIEW



- A business model addresses four key parts of a business: the customers (the “who”), the firm’s product and service offerings (the “what” and often the “why”), channels for reaching customers (the “where”), and pricing (the “how much”).
- A pricing model describes the amount customers are billed for units of products or services. A firm’s value proposition refers to the product attributes that lead customers to purchase the product rather than those of competitors. A firm’s value chain refers to how a firm structures its systems and processes to create value for its customers.
- Conventional business models are common and long established, while unconventional business models are based on innovations or industry-specific combinations and variations of conventional models.

- Digital technology has been particularly influential for business model innovation by generating new products, new channels, new ways to communicate and exchange information, and new methods for handling financial transactions.

LEARNING MODULE SELF-ASSESSMENT



These initial questions are intended to help you gauge your current level of understanding of this learning module.

1. _____ refers to characterizing types of customers a firm may serve according to attributes such as geography, demographics, behavior, preferences, income, affinity for technology, and self-image.

- A. Channeling
- B. Segmenting
- C. Direct selling

Solution:

B is correct. Companies often identify and group prospective or current customers into segments based on attributes useful for sales, marketing, and product design.

2. The objective of _____ is to maximize profit in situations where different customers have different willingness or ability to pay.

- A. unit economics
- B. price discrimination
- C. functional separation

Solution:

B is correct. Firms can price the same or similar products and services differently by customer segment, volume purchased, season, time of day, channel, and so on, based on perceived customer preferences to expand their addressable market.

3. Companies selling in markets with many competitors and little or no product differentiation are often _____; in contrast, companies selling differentiated products with few competitors tend to have _____.

- A. crowdsourcing; bundling
- B. price takers; pricing power
- C. omnichannel; direct sales

Solution:

B is correct. Markets with many competitors and homogeneous products are characterized by having perfect or near-perfect competition market structures, with prices determined by market supply and demand.

4. Two examples of pricing models for complex products are _____, which refers to incentivizing or requiring the purchase of multiple products or services, and _____, which combines a low price on an initial purchase of a durable good with high-margin prices on associated consumables.

- A. bundling; razor, razorblade

- B. fractional ownership; subscriptions
- C. horizontal integration; network effects

Solution:

A is correct. Companies often bundle complementary products and services by offering a discount for their combined purchase versus the sum of the individual prices, such as a product and a repair/maintenance package. A razor, razorblade model, named for Gillette's business model of selling a razor with disposable razorblades, combines a durable good sold at near cost with high-margin, possibly proprietary consumables needed to use the durable good. Other examples include Nespresso and Keurig coffee machines, printers and toner/ink, and diagnostic instruments and reagents.

5. _____ refers to the increase in the value of a network to its users as more users join.

- A. "Value chain"
- B. "Network effects"
- C. "Value proposition"

Solution:

B is correct. A network in which participants interact or transact with one another increases in value as more participants join. Examples of companies or services with network effects include financial instrument exchanges, payment networks, social media, and phone and other communication networks. Network effects can be a strong barrier to new industry entrants.

6. _____ involves user communities that enable voluntary collaboration between users of a product with generally a small amount of moderation and oversight by the community host or operator.

- A. Franchising
- B. Crowdsourcing
- C. A loyalty program

Solution:

B is correct. Generically, crowdsourcing means obtaining contributions from multiple parties. Many digital business models incorporate or utilize crowdsourcing as their defining feature, whereby the company creates a service that users build, while the company simply creates rules and moderates user contributions. Common examples include social media, product reviews, open source software, and Wikis.

DEFINING THE BUSINESS MODEL

2

- ☐ describe key features of business models

Successful new businesses may be based on a new product or technology, but there are many success stories based on familiar products or services and a new **business model**. For example, IKEA successfully combines existing business concepts—low-cost self-assembly furniture, modernist Scandinavian design, and big box retailing—in a

unique and successful way. Similarly, Google did not invent online search but found a way to improve the accuracy of search results and to generate revenues through advertising based on user search data.

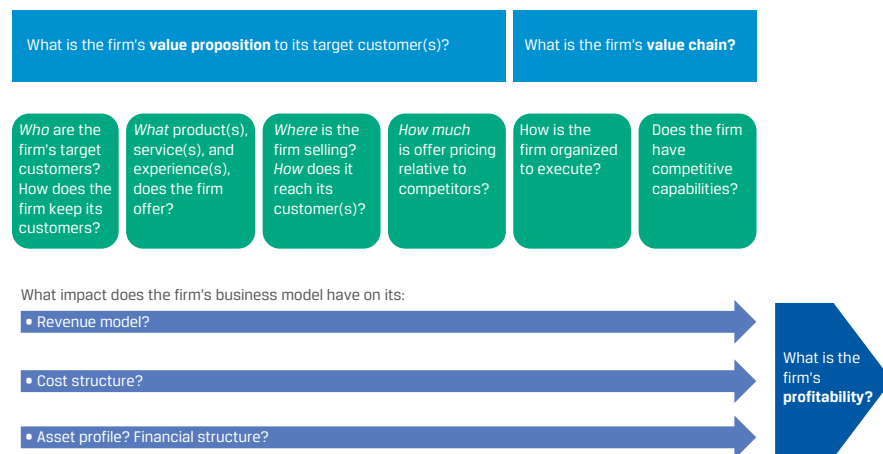
Often, successful business models are neither new nor unique but proven. Many businesses, such as wholesalers, retailers, law firms, building contractors, banks, and insurers, have conventional business models. Success for these firms hinges not on business model innovation but on superior execution, skill, proprietary technology, a strong brand, scale, scope economies, or other factors.

While there is no precise generally accepted definition of a business model, it is a description of how a business works and includes the following:

- The customer base for the business (“who?”)
- The product or service the business offers to customers (“what?” and often “why?”)
- Where is the firm selling and how do its products and services reach customers (“where?”)
- The pricing strategy (“how much?”)
- The key assets, partners, and suppliers the business requires (“how?”)

A business model should provide enough detail so that the basic elements and relationships are clear, without providing so much detail as to become a business plan. A clear business model should have the elements included in Exhibit 1.

Exhibit 1: Business Model



Business Model Features

Information needed to determine the business model of public corporate issuers is often provided in annual reports and presentations; management may even provide its own description of the issuer's business model. The beginning of Tesla's annual report provides a good example.

EXAMPLE 1**Tesla Management's Description of its Business**

"We design, develop, manufacture, sell and lease high-performance fully electric vehicles and energy generation and storage systems, and offer services related to our products. We generally sell our products directly to customers, including through our website and retail locations. We also continue to grow our customer-facing infrastructure through a global network of vehicle service centers, Mobile Service technicians, body shops, Supercharger stations and Destination Chargers to accelerate the widespread adoption of our products. We emphasize performance, attractive styling and the safety of our users and workforce in the design and manufacture of our products and are continuing to develop full self-driving technology for improved safety. We also strive to lower the cost of ownership for our customers through continuous efforts to reduce manufacturing costs and by offering financial and other services tailored to our products. Our mission to accelerate the world's transition to sustainable energy, engineering expertise, vertically integrated business model and focus on user experience differentiate us from other companies."

We can identify two business model elements from this paragraph.

What: "high-performance fully electric vehicles and energy generation and storage systems, and offer services related to our products" and "emphasize performance, attractive styling and . . . safety . . . and are continuing to develop full self-driving technology."

Where: "sell our products directly to customers, including through our website and retail locations. We also continue to grow our customer-facing infrastructure through a global network of vehicle service centers, Mobile Service technicians, body shops, Supercharger stations and Destination Chargers."

In the quote from Tesla, it describes its products and their attributes; venues in which it sells its products, known as sales channels or simply **channels**; and its emphasis on innovation. Analysts use a business model to begin their evaluation of how effectively it has been implemented, the company's prospects for future success, and understanding its implications for exposures to risks and opportunities. Management can change an issuer's business model or launch new businesses with distinct models within the same company, so this must be an ongoing analysis.

Let's explore the features of a business model further.

The Customers and the Market ("Who")

A business model should identify target customers:

- Are there specific types, or segments, of customers served?
- Are customers other businesses (business-to-business or B2B model) or consumers (business-to-consumer or B2C model)?
- What geographies will be served?

Tesla management's description is silent on which customer segments it is targeting, most likely because its target is shifting gradually toward the mass market with lower-cost and lower-price models. For an analyst, this type of inference can guide inputs for financial models, such as unit and price forecasts.

It is common in consumer markets to think of demographic segments, such as high-income suburban families. In many cases, segmentation is even narrower and is unique to the product or service category—for instance, “affluent early adopters of technology with homes that support plug-in charging in countries with EV subsidies.”

Business opportunities often arise because established firms may not effectively serve—or even recognize—certain prospective customer segments. At the same time, choices made concerning a firm’s target customers may introduce other related considerations or risks to the firm, such as high barriers to entry, changes in customer segment(s), or greater competition.

EXAMPLE 2

Segmenting Customers

Customers can be classified or segmented in numerous ways, including by their geography, demographics, seasonal or life-cycle timing, and behavior. Sophisticated market analytics can be used in **segmenting** to further break out smaller, homogeneous markets. Such analyses help such companies as Tesla to develop products and market them effectively.

Tesla positioned its products as the “new technology for clean energy” and moved away from being a company that solely produced expensive, premium electric sports cars to a company that defined what a practical, attractive, electric vehicle could look like. By targeting aspirational middle- and upper-class consumers who not only thrive on status-seeking behavior but also seek to be perceived to be environmentally friendly, socially and environmentally progressive, and cost conscious, Tesla expanded its customer markets.

Tesla and other companies can drill down to the postal code level for their customers and segment customers based on their social group, life-cycle stage, and wealth. This allows companies to identify customer cohorts across geographies and combine them into larger homogeneous markets that are easier to access and penetrate using targeted digital advertising.

Product or Service Offering (“What” and Often “Why”)

The business model should define what product or service the firm offers and how, if at all, it is different from competitor offerings by referencing the needs of its target customers. This helps the analyst identify the addressable market for the business and to understand key opportunities and risks. For example, there may be a high risk of imitation or substitution. Understanding why customers buy the product or service, or the “job” that customers are “hiring” the product or service to fulfill, can help analysts identify current and potential competitors. While trucks and railroads do not seem like competitors, they both fulfill the same customer need: the transportation of goods. A more thoughtful analysis would identify which types of customers and in which scenarios customers would choose truck versus rail transportation (as well as air and marine transportation).

Generally, business customers have straightforward needs (e.g., ship goods), are sophisticated buyers, and are motivated to earn a profit. Consumer customers have diverse needs that can be impossible to quantify. Some consumers purchase whichever car is the most economical on a cost per mile basis, while others look to purchase aesthetically pleasing, high-performance, or low-emission vehicles. Certain products can satisfy these needs, and companies can use advertising, promotions, and product placement in media to create these needs in the first place.

For Tesla, management describes its products quite precisely: “high-performance fully electric vehicles and energy generation and storage systems.” Some companies, however, will use overly broad terms in describing their offerings and addressable markets, overstate differentiation, or reference platforms and networks that may be very weakly developed—all in an attempt to convince investors that everyone could be a customer and inflate the value of the business. It is important for analysts to scrutinize management’s assertions and supplement them with independent research.

EXAMPLE 3

Business Model Evolution: Netflix

Netflix’s evolution since its start in 1997 is a prime example of how the “what” evolves over time. It started as a DVD rental by mail business in 1998, when the home movie rental business was dominated by brick-and-mortar rental stores and only 2% of the US households owned a DVD player. Netflix created and operated a website for customers to select DVDs to rent and delivered them through the mail. Subsequently, the company introduced a subscription model, where customers could rent several DVDs at one time for a fixed monthly fee. This new service disrupted the entire video rental industry.

Netflix’s direct rival at the time was Blockbuster, but it took Blockbuster years to offer the same service as Netflix. By that time, Netflix had launched a new business model: a subscription-based, online-streaming video platform, and began to de-emphasize its DVD rental business. Through substantial investment in video content and improving streaming technology, Netflix grew to millions of monthly subscribers. The monthly subscription fee is substantially lower than monthly cable service fees, though Netflix has increased prices significantly over time. Netflix has differentiated its platform by producing exclusive content.

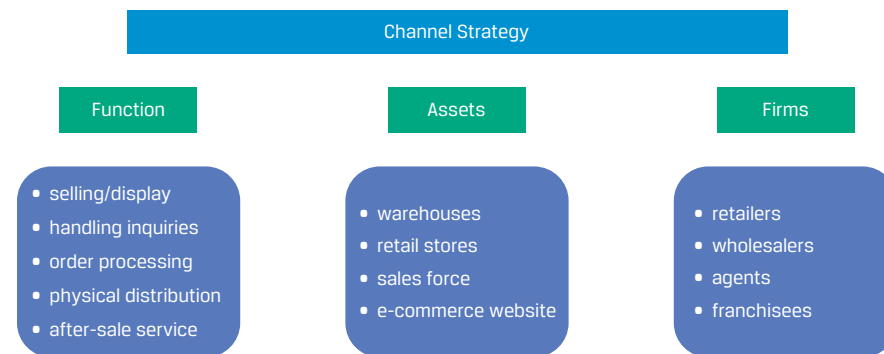
Blockbuster filed for bankruptcy in 2010 and ceased operations in 2014.

Channels (“Where”)

A firm’s channel strategy refers to “where” the firm is selling its offering; that is, how does it reach its customers? Channel strategy usually includes two main functions: selling the firm’s products and services (“sales and marketing”) and delivering them to customers (“distribution” or “logistics”).

In assessing a firm’s channel strategy, it is important to distinguish between what functions the firm can perform internally and what functions are better done by strategic partners and suppliers. For example, many business software companies do not install their software on customers’ systems. Instead, customers hire a third-party consulting firm, which often provides additional ongoing services. Exhibit 2 provides examples of the functions, assets, and firms that may be part of the channel strategy for a firm.

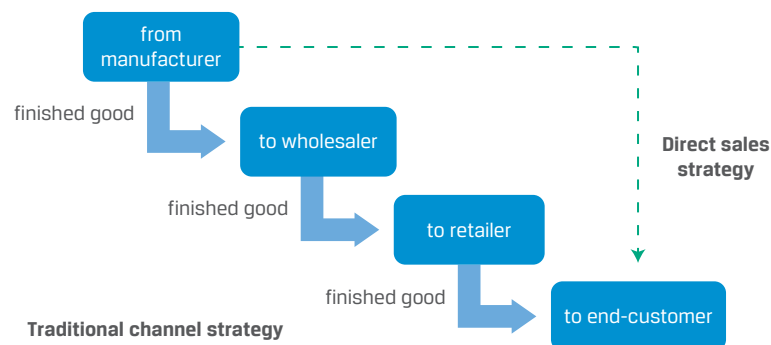
Exhibit 2: Channel Strategy: Functions vs. Assets vs. Firms



For companies that sell physical products, the traditional channel strategy is typically reflected in the flow of inventory through a series of intermediaries before reaching the final customer. Firms at each stage have their own physical facilities, and the product is purchased and then re-sold by the intermediaries at each stage until it is sold to the final customer.

Some companies, however, employ a **direct sales** strategy, selling directly to the end customer. Direct sales is a common and longstanding channel strategy for complex or high-margin products or services, such as medical devices, industrial equipment, and luxury goods. It is common in B2B models where the universe of potential customers is relatively small and easily reached. Historically, direct sales involved a significant investment in salespeople, but this is increasingly either substituted or supplemented with digital sales capabilities. Exhibit 3 contrasts the interactions of a traditional channel strategy with a direct sales strategy.

Exhibit 3: Traditional Channel Strategy (Product) vs. Direct Sales Strategy



Often, channels are used in combination. A so-called **omnichannel** strategy, common for apparel and consumer packaged goods, relies on both digital and physical channels to complete a sale. For example, a customer might order an item online and pick it up in a store or select an item in a store and have it delivered.

EXAMPLE 4**Adidas**

Adidas is the world's second largest sportswear brand and combines four channels to distribute its products: retail shops, franchise outlets, wholesale business, and its own e-commerce. The following excerpt from its annual report summarizes its channel strategy:

"With more than 2,500 own-retail stores, more than 15,000 mono-branded franchise stores and more than 150,000 wholesale doors, we have an unrivaled network of consumer touchpoints within our industry. In addition, through our own e-commerce channel, our single biggest store available to consumers in over 40 countries, we are leveraging a consistent global framework."

Source: Adidas AG Annual Report 2019 <https://report.adidas-group.com/2019/en/group-management-report-our-company/corporate-strategy/sales-and-distribution-strategy.html>

The channels used by a business are material drivers of revenues and cost behavior, profitability, and sensitivity to internal and external risk factors. Companies that employ a direct sales strategy have the advantage of a close relationship to customers and do not risk their products being shown alongside competitors on a shelf. However, direct sales impose significant cost, an important portion of which is fixed salaries and benefits.

How a firm's channel strategy differs from those of its competitors is an important factor to consider. For example, Tesla references its direct sales strategy, which is different from its US competitors, which sell to franchised dealers. This difference will affect comparability of financial results between Tesla and US automakers.

Pricing ("How Much")

A business model needs to provide sufficient detail about pricing so that the logic of the business is clear.

- Does the firm price at a premium, at parity, or at a discount relative to competitors?
- How do prices and costs compare?
- How is the firm's pricing justified in its business model?

Companies selling in markets with many competitors and little or no product differentiation are price takers that simply receive the market price determined by supply and demand; they are known as **commodity producers**. Examples of **commodities** include oil and gas, pharmaceuticals that are no longer patented, and many types of loans. Companies selling in markets with few competitors or with highly **differentiated products** enjoy more **pricing power**, or the ability to maintain prices above costs or increase prices without negatively impacting customer demand. A business that does not have pricing power is likely to pursue a cost leadership strategy, seeking to be the lowest-cost producer, such as discount retailers Costco and Lidl and the low-cost airline Ryanair.

Companies charging premium prices may justify doing so by emphasizing cost savings for customers elsewhere or by adding services for a reduced price (or free). For example, while Tesla's vehicles are priced at a premium, the annual report references a lower total cost of ownership, which refers to the aggregate direct and indirect costs associated with owning an asset over its life span. After considering government subsidies and the lower costs of electric charging compared with petroleum, the price is more competitive (though there is a risk of subsidies decreasing or ceasing in the

future). This value proposition— the reduced total cost of ownership through some combination of product capabilities, reliability, ease of maintenance and operation, training, and so on—is common to business models in many sectors.

In some cases, however, companies do not “justify” premium pricing but, rather, establish strong brands and distinctiveness that customers value. While some of Tesla’s prices can be justified based on lower total costs of ownership, much of it is owed to the aesthetic, performance, and intangible characteristics valued by customers and created by the company and its advertising. The same is true for most premium and luxury goods and services.

Pricing and Revenue Models

A pricing model describes how much money customers are billed for units of products or services. There are many models because there are many ways to specify a unit of product or service, and varying prices can be established, known as **price discrimination**, based on such factors as quality or grade, units sold, channel, customer size and type, and unit cost. The objective of price discrimination is to maximize profit in a situation where different customers have different willingness to pay. It may also be less costly to serve certain customer segments, such as large-volume buyers.

Rather than changing list or published prices, companies often implement pricing strategies using variable discounting, promotions, and bundles. For example, a customer may be offered a discount that other customers are not offered, and companies may adjust prices by changing the generosity of promotions rather than changing list prices. Prices adjusted for these are typically referred to as net prices.

Common pricing models include the following:

- **Tiered pricing:** Charging different prices to different buyers, often based on volume purchased but also based on product features (e.g., base versus premium trims of vehicles)
- **Dynamic pricing:** Charging different prices at different times and for different types of customers depending on such variables as available supply levels and demand. Specific examples include seasonal pricing for hotels, where prices may be high in the summer for beachfront properties and low in the winter, and surge pricing by ride-sharing companies Uber and Lyft, in which prices are raised in periods of exceptionally high demand.
- **Value-based pricing:** Setting prices based on the value received by the customer, which often involves estimating opportunity cost. This approach is commonly attempted in pharmaceuticals, where, for example, the price of a new drug that reduces the risk of stroke by 33% would reflect the savings from avoided hospitalization and death. Such an approach leads to different prices for different drugs since drugs vary in effectiveness and the type of disease they treat, and the prices of hospitalizations, physician services, and so on, that may be avoided from their use also vary by country.
- **Auction/reverse auction models:** These models establish prices through a bidding process. Digital technology enables this process to be automated, making these models feasible in new categories (e.g., Google and Baidu for digital advertising and eBay for consumer merchandise).

Some pricing models are used by firms selling multiple or complex products:

- **Bundling** refers to combining multiple products or services so that customers are incentivized or required to buy them together. Bundling can be effective, particularly for products that are complementary and that have high

incremental profit margins and high marketing costs relative to the cost of the product itself. Examples include phone, cable TV, and internet services or application software with cloud-based storage.

- **Razor, razorblade pricing** combines a low price on an initial purchase of equipment (e.g., razor, printer, gaming console, diagnostic equipment) with high-margin prices on repeat-purchase consumables associated with the equipment (razorblades, printer ink, games, reagents). Often, companies design the equipment to work only with their proprietary consumables. Other companies selling generic consumables can render this pricing model unprofitable.
- **Add-on pricing** applies when a customer buys additional but optional services or product features, either at the time of purchase or during product use. A common strategy is to seek profitable pricing on the add-on when the customer is “captive” after the initial purchase decision has been made, such as in-game or in-app purchases of content and features. Firms that take this strategy too far, however, can damage customer goodwill and their reputation.

Businesses that seek to expand their footprint quickly may select an approach in which they use **penetration pricing**, or discounting willingly to build scale and market share, albeit at the cost of margins. It can be thought of as effectively a marketing expense to acquire customers. Examples include mobile phone providers discounting smartphones and Amazon discounting its Alexa-enabled tablets, e-readers, and speakers. However, penetration pricing can be controversial if implemented for a long period, because regulators may see the practice as unfair or anti-competitive and investors may question when or if the company will achieve profitability.

For digital businesses, growing a user base is often a critical objective, since the incremental costs associated with one more customer subscription are often minimal and the benefits can be enormous, including promotion through word of mouth and, potentially, network effects. Trial and adoption can be encouraged through pricing strategies that include the following:

- The pricing in a **freemium business model** allows customers a certain level of usage or functionality at no charge or with ads, for example with news content, a software application, or a game. This model is widely used in digital services with network effects when the company is seeking to scale up.
- A **hidden revenue business model** provides services to users at no charge and generates revenues elsewhere. This is a common feature of both legacy and digital business models in the media sector, with “free” content and paid advertising. Examples can also be found in online marketplaces, where sellers pay and buyers do not, and financial services with debit cards, checking accounts, and security trading that appear free.

Some business models create value by providing an alternative to ownership and provide use of the product without purchasing an asset or product. The simplicity of electronic invoicing and payments and the value that businesses and investors place on predictable, recurring revenue streams have driven the introduction of subscription pricing models in new areas.

- Subscriptions deliver products or services—or access to them—in exchange for recurring fees. Traditionally, the subscription model is associated with media and utilities. However, subscription models have been extended broadly to many sectors, notably application software and cloud computing

infrastructure. Subscription fees can be fixed, discounted for promotional offers, tiered according to features, or based on customer usage, such as in utilities, payment processing, and cloud computing.

- Leasing, licensing, and franchising, while all different, are also all like subscriptions but involve the transfer of property or access to it rather than a product. Leasing is typically used when the property is real estate or another physical asset, licensing is for intellectual property, and **franchising** is a more comprehensive form of licensing, in which the franchisor typically gives the franchisee the right to sell or distribute its product or service in a specified territory and to receive marketing and other support. Specifics on these important but complicated forms of recurring-revenue models will be covered in greater detail in later lessons.

The Value Proposition (Who + What + Where + How Much)

A **value proposition** refers to the product or service attributes valued by customers that lead them to purchase the product and prefer one firm's offering over those of its competitors, given relative pricing. These vary greatly and relate to factors such as the following:

- Product and service itself—its capability, performance, features, and style
- Service and support behind the product and service—whether it is “high-touch” or “low-touch” customer service, depending on the requirements of the customer and the type of product or service, access to repairs, spare parts, and so on
- Sale process (e.g., purchasing convenience, no-hassle returns)
- The pricing relative to competitors

Crafting a compelling value proposition requires management to carefully consider these factors. For instance, Tesla's value proposition goes beyond transportation: It emphasizes the benefits of its electric propulsion system, zero emissions, and high performance with strong and silent acceleration, as well as technological sophistication, including self-driving capabilities and other enhancements via ongoing software upgrades. Additionally, an important part of Tesla's value proposition is its proprietary network of high-speed charging stations. It is a major undertaking for Tesla to build this network in multiple countries, but doing so can provide a competitive advantage against market entrants. Finally, Tesla has engendered significant customer loyalty from the aesthetics of its vehicles, the personality of its founder, and word-of-mouth marketing from customers and online influencers.

EXAMPLE 5

HD Tools Business Model

The fictional firm HD Tools sells tools. It is considering two business models, A and B. Elements of each are presented in the following table.

	Business Model A	Business Model B
Customer segment	▪ Apartment dwellers and new homeowners	▪ Do-it-yourself/professional trades
Products	▪ Simple, low-priced kit of tools	▪ A full assortment of high-quality tools for individual purchase

	Business Model A	Business Model B
Channel	▪ They do not shop at home improvement stores and are likely to buy a kit online or from a mass retailer.	▪ They frequent large home improvement stores and specialty trade distributors.
Customer profile, need	▪ They may not know what tools they need and may have none to start with. ▪ Occasional use to do everyday repairs	▪ Their time is valuable. ▪ They know and can differentiate between tools and brands. ▪ Heavy-use, high-quality requirement
Relative pricing	▪ Low and affordable price point	▪ Premium priced tools
Customer value	▪ A single kit contains several tools they are likely to need. ▪ A simple and compact toolbox given limited storage space	▪ Will pay a premium for a tool that they are confident will be durable and will perform
Service expectations	▪ After-sales support is not critical, provided there is an acceptable return policy	▪ After-sales support not critical, but prefers interacting with knowledgeable staff ▪ Product availability important

Each of these business models is valid for its respective customer segment. Both require distribution to disparate customer bases. However, Model A (low-priced kits) could potentially be established at a smaller scale online or by gaining shelf space at a handful of large retailers.

With Model A, the challenge will be to have a low-enough product cost to generate an acceptable margin for the business. Differentiation against other kit providers might be also achievable through better online customer reviews, product aesthetics, a better selection of tools, or perhaps an extra feature not offered by competitors—for example, by bundling with a selection of common fasteners, aimed at maximizing customer convenience at a low price point.

With Model B, the more critical factor is likely to be product quality, price, and distribution. The professional market requires tools that are of demonstrably high quality so that their customers, who are knowledgeable, will choose them over established rival brands. This might be difficult for a new brand, such as HD. However, HD might be able to overcome this, with objective statements about the quality of materials used in making the tools, their strength and durability, a lifetime warranty and generous return policy, marketing aimed at professionals, and working with specialist retailers to promote the product.

Businesses can be constrained in their value proposition by regulations, customers that prioritize price above all other factors, or the firm selling a commodity product with thin margins.

Business Organization and Capabilities

Evaluating a firm's business model requires consideration not only of the value proposition but also "how" the firm is structured to deliver. Specifically, what labor and capital resources, relationships, intellectual property, and other capabilities and assets does the firm require to execute on its business model, and will the firm need to own them or can they be contracted for. If a firm is dependent on other firms for critical inputs, those supplier relationships can become key elements of its strategy and a potential risk.

EXAMPLE 6**Both a Key Supplier and Competitor**

Netflix, the digital entertainment company, sells a streaming video service through its website and mobile applications. While it produces and licenses content, it relies on the services provided by internet service providers, such as broadband and wireless telecom companies, to reach its customers. Additionally, Netflix relies on digital infrastructure companies to enable the delivery of content to its more than 200 million subscribers globally whenever and wherever they want. One digital infrastructure company is Amazon, which, through its Prime Video streaming service, is also a significant competitor for Netflix.

In its annual report, Netflix noted the following under its risk factors:

“Amazon Web Services (“AWS”) provides a distributed computing infrastructure platform for business operations, or what is commonly referred to as a “cloud” computing service. We have architected our software and computer systems to utilize data processing, storage capabilities and other services provided by AWS. Currently, we run the vast majority of our computing on AWS. Given this, along with the fact that we cannot easily switch our AWS operations to another cloud provider, any disruption of or interference with our use of AWS would impact our operations and our business would be adversely impacted. While the retail side of Amazon competes with us, we do not believe that Amazon will use the AWS operation in such a manner as to gain competitive advantage against our service, although if it were to do so, it could harm our business.”

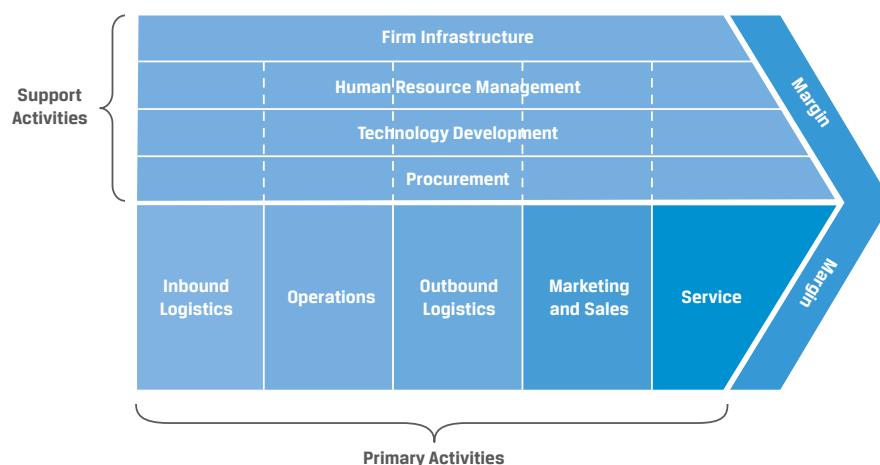
The auto business has traditionally been organized with automakers supplied by networks of parts manufacturers. Parts manufacturers might supply very specific components, such as tires, or complete assemblies, such engines. There is generally a very close relationship between automakers and their suppliers because parts or assemblies are often custom designed for a particular vehicle. When the supplier becomes involved at the design stage and throughout the production stage, it improves quality and interoperability, though specificity of parts increases reliance on single manufacturers and the risk of supply interruptions. For instance, in the wake of the COVID-19 pandemic, undersupply of some semiconductor inputs resulted in significant supply disruptions and lost sales for automakers. In some cases, automakers outsource vehicle production entirely, as in the case of Porsche outsourcing to Valmet and Magna Steyr.

Tesla’s business model is different because it emphasizes vertical integration, with in-house development and production of key components, such as batteries and software/electronics. This requires substantial capital and effort and is therefore an unusual choice for a new company but is consistent with Tesla’s strategy of proprietary technology.

The “how” aspect of a business model is also referred to as a firm’s **value chain**—that is, the systems and processes in a firm that create value for its customers. The value chain includes only those functions performed by a single firm, including functions that are valued by customers but may not involve physical transformation or handling the product. Note that a firm’s value chain is different from its **supply chain**, which refers to the sequence of processes involved in the creation of a product, both within and external to a firm. A supply chain includes all the steps involved in producing and delivering a physical product to the end customer, regardless of whether those steps are performed by a single firm. For businesses, where marketing and sales are strategically critical functions, the “value proposition” includes the channels used to reach customers, the value the firm might deliver through the sales and service functions.

Value chain analysis provides a link between the firm's value proposition for customers and its profitability, as Exhibit 4 shows, and was originally conceptualized by Porter in 1985.

Exhibit 4: Business Value Chain Components: Support and Primary Activities



These activities are core to each firm, and the extent and significance each of these roles play in the day-to-day activities of firms depend on the scale of the business and its operations. Additionally, the firm's four primary "support" activities include procurement, human resource management, technology development, and firm infrastructure. This provides a useful starting point for evaluating the value chain of a company, although dramatic advances in digital technology have radically changed the way that some of these functions are carried out in many businesses. When analyzing the value chain, each component should be evaluated by first identifying the specific activities carried out by the firm, then estimating the value added and costs associated with each activity, and finally identifying opportunities for competitive advantage.

Finally, a business model should reveal how the firm expects to generate a profit. That is, how and why prices and volumes not only cover but exceed variable and fixed costs today or in the future at a greater scale. An analyst will want to examine margins, break-even points, and **unit economics**, which expresses revenues and costs on a per-unit basis. For example, Amazon Web Services and the cloud infrastructure business model is based on a *decline over time* in both unit costs and unit prices as volumes increase and technology improves. This would be expected to create a virtuous cycle: Lower prices enable cloud computing providers to expand customers and usage, which in turn lowers costs because most costs are fixed; in fact, unit costs fall faster than prices, so profits increase. Overall, this is a considerable barrier to competition, because a new entrant that matched the prevailing price would suffer losses because they did not have the economies of scale to have low costs.

In summary, a business model answers several key questions:

- What is the firm selling?
- To whom?
- For how much?
- How is the company going to execute?

- How much does it cost, and how will costs behave as size and conditions change?

QUESTION SET

An analyst is evaluating two bicycle manufacturing companies: Winston Bikes and Carbondash.

Winston Bikes manufactures inexpensive, mass-market bicycles and sells them through a variety of physical retailers. It uses the latest in robotic technology to do its manufacturing, and it leases the robotic equipment under an arrangement where it can easily increase or decrease the amount of equipment it uses. It uses conventional, established, common, and simple designs and uses materials that are inexpensive and widely available.

Carbondash produces premium, high-quality, complex bicycles by hand. Its technicians are highly trained over long periods of time and are under long-term employment contracts. It uses unconventional, sophisticated, highly precise designs. It manufactures its frames with a proprietary and highly specialized variant of carbon fiber that is infused with a rare earth metal that is available from only one mine in the world. Everything is custom measured and custom fit to the rider by highly trained salespeople in retail outlets located in expensive, prestigious physical locations. It serves a loyal customer base that is relatively insensitive to price.

1. If a sudden change in market demand happens, which company will be better able to handle it?

Guideline solution:

If there is a sudden change in market demand, whether an increase or a decrease in demand, Winston Bikes will most likely be able to handle it better than Carbondash. Because of Winston Bikes' flexible lease arrangements with its manufacturing robots, it can easily scale its manufacturing up or down in response to changes in market demand. Carbondash, however, has a heavy dependence on skilled human labor. It can't scale up quickly because its technicians require long periods of training, and it can't scale down easily because of its long-term labor contracts.

2. Why might the risks of supplier disruption be lower for Winston Bikes than for Carbondash?

Guideline solution:

Carbondash faces higher risk of supplier disruption because it single-sources its materials from one company, uses a proprietary design that requires specialized manufacturing techniques, and uses a special ingredient that is available from only one source in the world. Winston Bikes, in contrast, uses many suppliers and has simple designs and widely available materials that can be used by many suppliers.

3. Why might the risks of increases in material costs be lower for Carbondash than for Winston Bikes?

Guideline solution:

Winston Bikes is a low-cost business that competes on price and has thin margins. It is a price taker and so is unable to raise its prices without suffering a decrease in sales. Its thin margins mean that it can't absorb cost increases and remain profitable. Carbondash, in contrast, relies on differen-

tiation of its products and has a loyal customer base that is less sensitive to price. Because its margins are higher, it is better able to absorb an increase in the cost of its materials, and because its customer base is loyal and less sensitive to price, it is able to raise its prices without a significant adverse impact on its sales.

4. Which company will most likely:

- a. be larger?
- b. have higher prices?
- c. have higher costs?

Guideline solution to a:

Winston Bikes will most likely be larger than Carbondash, at least in terms of units sold. Winston Bikes operates on thin margins and so must have a high volume in order to generate sufficient profitability to survive. Carbondash, in contrast, is likely a high-price, low-volume manufacturer. Winston Bikes has omnichannel distribution, which puts its products in front of more customers. Carbondash uses direct sales in physical stores using salespeople to create relationships.

Guideline solution to b:

Carbondash will most likely have higher prices. It pursues a product differentiation strategy, and it targets a customer base that is relatively price insensitive. Winston Bikes competes on price and so must have low prices.

Guideline solution to c:

Carbondash most likely has higher costs per unit because of all the human labor involved throughout the manufacturing and sales process. The bikes are assembled by hand and are sold using direct sales in its own stores with its own sales staff. Winston Bikes uses the latest in software and robot manufacturing technology in order to keep costs as low as possible, and it uses distribution channels whereby it doesn't need to pay for stores or sales staff.

5. An analyst sits down for a meeting with the management team of Luggo Corporation, who is describing their business. The CEO makes the following statement:

Luggo makes premium parts to secure wheels onto cars and trucks. We differentiate ourselves from our competitors by using premium designs and building our products from the finest titanium to ensure strength and light weight. We distribute our products through wholesalers that supply physical retail stores, and we price at parity with the market.

What parts of the business model did the CEO not describe?

Guideline solution:

The CEO did not describe the firm's customers. This is one of the key attributes of a business model and describes how the firm segments its customer base and which segments it is targeting with its products. Customers can be segmented in numerous ways, including by their geography, demographics, seasonal or life-cycle timing, behavior, social group, and wealth. Segmenting allows companies to identify customer cohorts across geographies and combine them into larger homogeneous markets that are easier to access and penetrate using targeted marketing. Business opportunities often arise

because established firms may not effectively serve—or even recognize—customer segments.

3

BUSINESS MODEL TYPES



describe various types of business models

Conventional Business Models

Some business models are common and have existed for a long time. Alone or in combination with one another, these conventional models make up most business models in practice and are thus essential for analysts to understand. We briefly describe eight conventional models in Exhibit 5 using the framework in the prior lesson. In practice, each industry sector tends to have its own version of these conventional models, with specific features, such as “athletic apparel manufacturer.”

Business Model Variations

While the conventional business models are enough to describe many companies, there are many others in practice. Most of them are simply combinations of the conventional models or industry-specific variations.

- Private label or **contract manufacturers** that produce goods to be marketed by others. This is a common arrangement, particularly for offshore production. Apple and NVIDIA, for example, do not manufacture their own branded products but instead contract with many specialized contract manufacturers in Asia. Apple and NVIDIA manage a web of complex relationships, while specializing in R&D, product design, and sales and marketing.
- **Value added resellers** not only distribute a product but also handle more complex aspects of product installation, customization, service, or support. This is common with complex, service-intensive products, such as construction machinery, IT hardware, and enterprise software.
- **Licensing arrangements** in which a company will produce a product using someone else’s brand name in return for a royalty: This is common in toys and apparel, for example, when manufacturers might pay for the right to use the name of a famous film character, a sports team, or a brand that has become popular in a related category, such as sporting goods.
- Franchise models in which franchisees have a tightly defined and exclusive relationship with a franchisor to operate under a specific brand with proprietary products and processes. Restaurants, retailers, and auto dealerships are common types of franchises. The franchisor earns a royalty on the franchisee’s sales. The franchisor is responsible for product development and advertising, for which it often collects an additional fee from franchisees.

Exhibit 5: Conventional Business Models

Conventional Model	Customers	Products	Channel	Pricing	Key Inputs Required	Example
Natural Resource Producer	- Refiners - Distributors	Usable natural resources and raw material	Contracts with refiner or distributor, based on spot or forward prices	Spot or forward market prices in contracts	- Rights to natural resources with profitable economics - Technical expertise	Total Energies, a French oil and gas producer
Manufacturer	- Distributors - End-users (direct)	Finished goods	- Distributors - Direct salespeople or digital	- Price per product sold - Subscription	- Raw materials - Brands - Creative and technical expertise	L'Oréal SA, a French cosmetics and beauty company
Distributor	Retailers	Transportation and storage	Retailers	- Spread on purchase price vs. sales price - Delivery or service fee	- Transportation assets - Selection of products	McKesson, a US distributor of pharmaceuticals and medical supplies
Retailer	End-users	- Finished goods - Customer experience	- Stores - Direct salespeople or digital	- Mark-up on products sold - Member service fees	- Selection of product - Physical or digital storefront	JD.com, a Chinese first-party e-commerce company
Broker	Buyers and sellers	Connecting buyers and sellers	- Salespeople - Digital	- Commissions - Listing fees	- Large numbers of both buyers and sellers - Digital platform	Pinduoduo, a Chinese e-commerce platform for third-party merchants
Bank	Borrowers	- Loans - Leases	- Digital - Branches, Loan officers	Loan and lease interest rate spread over interest rate paid for funding	- Deposits and other sources of funding - Borrower relationships	HSBC, a UK-based global financial services company

Conventional Model	Customers	Products	Channel	Pricing	Key Inputs Required	Example
Service Producer	▪ Services	▪ Services	▪ Direct salespeople or digital	▪ Service fees	▪ Customer relationships	▪ Infosys Ltd., an Indian technology consulting and outsourcing company
	▪ Businesses			▪ Mark-ups on product used or sold	▪ Technical expertise	
Software	▪ Services	▪ Software	▪ Direct salespeople or digital	▪ Subscription fee	▪ Technical expertise	▪ Shopify Inc., a Canadian software and services company for e-commerce merchants
	▪ Businesses			▪ License costs • • Maintenance fee	▪ Channel partner	
					▪ Digital support infrastructure	

Business Model Innovation

Most discussion of business models focuses on innovation: how new business models can be introduced or adapted to existing markets. While not requiring it, business model innovation is often combined with technological innovation and pioneered by new market entrants rather than industry incumbents.

Exhibit 6 identifies several historical cases of business model innovations in various industries. Notice how innovation becomes convention over time.

Exhibit 6: Business Model Innovation Historical Examples

Industry	Business Model Innovation	Innovative Features
Airlines	Low-cost and ultra-low-cost airlines	- Customer: leisure, mass market - Product: Point-to-point flights - Low prices - No frills, low costs - Channel: direct, digital sales
Software	Software as a service (SaaS)	- Price: monthly fees rather than upfront license - Customer: broader, owing to pricing
Retailing	- Discount retailing - E-commerce - Digital marketplaces	- Prices - Product selection - Channel
Securities brokerage	Discount brokers	- Customer: individuals - Low or free commissions - No extra services or research, low costs - Channel: direct, digital sales

Digital technology has generated many new products, such as streaming video, digital advertising, social media, and dating apps and has enabled many business model innovations, such as digital marketplaces. While large-scale business model innovation did not start with digital technology, the rapid and open-ended advance of digital technology has dramatically changed how businesses operate by radically reducing the cost of communicating, exchanging information, and financially transacting. This had several direct implications for many businesses:

- Location matters less. Digital communications and e-commerce enable customers to shop and purchase more easily from firms having no local physical presence.
- Outsourcing is easier, for similar reasons.
- Digital marketing makes it easy and cost effective to reach very specific groups of customers, regardless of location, and to engage more deeply with them than was possible with traditional advertising.
- Network effects, discussed next, have become more powerful and accessible to more firms.

Network Effects and Platform Business Models

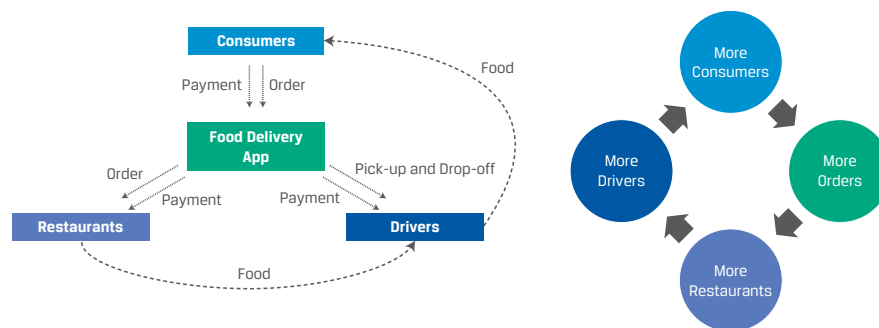
Network effects refer to the increase in value of a network to its users as more users join. Many internet-based businesses are built on network effects; for example, China's WeChat messaging and payment platform is valuable to its users in large part because

it is used by so many people. Once it achieved a high enough number of users, it also became available to marginal users, further increasing user growth. Online classifieds, social media, and ride-sharing services are other examples. Network effects capitalize on both economics of scale and scope. Network effects are also at work in many older, pre-internet businesses, such as telephone service, payment systems including credit cards, and financial infrastructure, such as stock exchanges. In all these businesses, the key metric is the number of users and the growth rate of users.

“One-sided” network effects apply in networks where it is only one *type* of user that is valuable to other users: for example, telephone services and peer-to-peer payment systems, such as Venmo, a mobile app owned by PayPal that enables users to easily transfer, deposit, and withdraw money. Connections between users are crucial, but there is one type of user. Depending on the size and the connections of the network, the marginal cost of acquiring each additional user is lower than the revenue generated by adding the user to the network.

In some cases, networks are composed of two or more *types* of users, which can be described as “two-sided” or “multi-sided” networks, such as buyers and sellers in an online marketplace. The typical example for these multi-sided platforms includes credit and debit card networks, such as Visa and China Union Pay, composed of both merchant and cardholder users. Other examples include digital marketplaces, such as Airbnb, composed of both hosts and guests. As these multi-sided networks grow—more users join the service, which attracts more merchants, which in turn attracts more users—these businesses can grow exponentially. The growth of food delivery services connects restaurants, independent drivers, and customers and has evolved through multiple interdependent network effects. As each of the three groups has grown, they in turn increase the aggregate size of their networks, as Exhibit 7 shows. Network effects create strong barriers to entry and are a form of competitive advantage.

Exhibit 7: Multiple Network Effects for Multi-Sided Platforms



Network business models often include **crowdsourcing**, where users contribute directly to a product or service. Examples include social media, such as TikTok/Douyin and Reddit; open-source software; knowledge aggregators, such as Wikipedia; and customer reviews and feedback on, for example, Yelp, Amazon, and TripAdvisor. These businesses facilitate “user communities” that enable voluntary collaboration between users of a product with a small amount of moderation and oversight by the company.

EXAMPLE 7**Business Model Evolution in the Hotel and Travel Industry**

The hotel industry provides a good illustration of business model evolution over time and the emergence of different business models, with varying financial characteristics. Until the 20th century, business model evolution was slow. In response to increasing scale and specialization demanded by a growing market, hotels became larger and more numerous but with little change in the basic business model. The 20th century brought major changes to business models in the industry. The single-property hotel business remained a relevant business model, due to the inherent uniqueness of certain hotel properties.

However, with a much larger and highly mobile customer base, hotel operators saw an opportunity, with the need to serve a growing corporate travel market, increase the scale and footprint of their businesses, and provide convenience and consistency to customers, thereby increasing operating efficiency. Some specific examples are outlined below.

Impact	Example
Scale	Large, global hotel chains and brands with multiple locations that serve highly mobile customers in numerous market segments. Intercontinental Hotels & Resorts has more than 15 brands in approximately 6,000 locations. Brands range from basic to luxury and extended stay.
Specialization	Specialized lodging businesses to serve specific market segments Resort hotels, vacation packages (bundled flights + lodging + meals), casinos, weekly/monthly accommodation (for out-of-town executives)
Franchising	Applying the franchise approach to the hotel business Most Hilton Hotels properties are not owned or leased by Hilton but are operated by franchisees who pay fees.
Functional separation	Specialized businesses handling such functions as branding and marketing, property ownership, management, and development REITs and property ownership: The largest hotel companies seldom own all their hotels; some own none. Host Hotels & Resorts, the world's largest hotel REIT, owns close to 100 hotel properties and is the largest third-party owner of Marriott and Hyatt hotels.
Fractionalized ownership	Fractionalized ownership in the form of time-sharing, creating a new lodging category between the hotel and the vacation home Wyndham Destinations is the largest vacation ownership company. The company develops, sells, and manages time-share properties under various vacation ownership clubs.
Loyalty programs	The introduction of programs to increase brand loyalty among high-value, frequent travelers Hotel loyalty programs first introduced by Holiday Inn and Marriott in 1983

The digital transformation of business models has also impacted the hotel business. To increase the efficiency in marketing and distribution of hotel and travel-related services, Online Travel Agency (OTA) reduced the complexities of travel planning and bookings. In both its traditional and online forms, the travel agency business is a two-sided network.

Like a traditional travel agent, OTA assists travelers with research and planning, price comparisons, bookings, and logistics. For hotels, it provides exposure, leads, bookings, customer information, feedback, and competitive intelligence. Automating these functions and delivering them as a web-based service so greatly improved their convenience, speed, and efficiency that the business model was transformed, shifting the relationship and the balance of power between agencies and their hotel customers. Effectively, through network

effects, OTA disintermediated the traditional travel agency model and forced the remaining agencies to specialize. Examples of differing OTA business models are shown below.

OTA Business Model	Description	Examples
Price-comparison “aggregators”	These network-based businesses offer buyers and sellers in the hotel and travel community travel-related price comparison services and bookings.	Booking.com, Expedia, Ctrip, eDreams
Crowdsourcing	These platform businesses provide crowd-sourced reviews and information on hotels and other travel services.	TripAdvisor.com
Home sharing/short-term rental service	These platform businesses have challenged and disrupted the traditional hotel model by supplying a variety of temporary, often unique, accommodations.	Airbnb; Vrbo (acquired in 2006 by HomeAway, which in turn was acquired by Expedia in 2015)

Hotel operators have responded to these challenges by investing in their own websites, customer data, and direct booking capabilities or selling directly to various sites. Some traditional hotel chains, which have historically emphasized consistency and uniformity, have launched so-called soft brands, which are hotels that operate under their own name but with a greater degree of local operator autonomy. Moreover, they have created hybrid hotel solutions, such as condo-hotels (condos in a hotel that are at the disposal of the owner but are rented out otherwise by the hotel).

QUESTION SET



Bynta is a new entrant in the retail clothing industry. It is competing against Ocean Hill Inc., an established industry incumbent that uses a conventional business model.

1. What attributes of a conventional retail business model will Bynta and Ocean Hill Inc. likely share?

Solution:

The four major components of a business model framework are customers, products, channels, and pricing. Bynta and Ocean Hill Inc. will likely be similar in that their customers will be end users of the products, their products will be finished goods, and their pricing will be based on markup on products sold.

2. What most likely would distinguish Bynta from Ocean Hill Inc.?

Solution:

Bynta can distinguish itself from Ocean Hill Inc. by using digital technology to reduce the cost of communicating, exchanging information, and financially transacting. With digital technology, location matters less because e-commerce allows for shopping and purchasing without the need for a physical storefront.

Outsourcing to private label or contract manufacturers is also made easier with digital technology and will allow Bynta to focus more on product design, sales, and marketing.

Improved customer segmentation is also enabled by digital technology, allowing for segments that are narrower and unique to Bynta's product categories. Digital technology in marketing will make it easier and more cost effective for Bynta to reach very specific customer segments, regardless of location, and to engage more deeply with them than is possible with traditional advertising. Sophisticated market analytics can be used to break out smaller, homogeneous markets. This will allow Bynta to identify customer cohorts across geographies and combine them into larger homogeneous markets that are easier to access and penetrate using targeted digital advertising.

Bynta can also benefit from network effects and crowdsourcing by facilitating user communities that enable voluntary collaboration between its customers.

3. Given an increase in the price of raw materials/commodities, what is the difference in revenue/profit impact for producers versus manufacturers versus distributors and retailers?

Solution:

A supply chain includes all the steps involved in producing and delivering a physical product to the end customer, regardless of whether those steps are performed by a single firm. Different firms at different points in the supply chain may attempt to mitigate the impact of raw materials/commodity price increases in different ways. Some firms may try to stabilize revenues by entering long-term customer or hedging contracts.

While these are often available for firms at the beginning of the supply chain, where there are established markets for contracts on raw materials, it is less possible further down the chain. For example, producers that sell natural resources or commodities and manufacturers that buy them can enter derivative contracts in the forward markets to secure more stable pricing for the products they sell or the key inputs that they need.

Further down the supply chain, distributors and retailers may secure long-term contracts to ensure stabilized prices, though they are unlikely to have access to structured and highly liquid derivative contracts. The manufacturing stage of the supply chain creates products that are too differentiated to support broad derivative markets as there are with commodities.

One risk is that if a firm locks in a sale price for its products while not locking in a purchase price for its raw material key inputs, it faces the risk of substantial loss if the cost of raw materials increases in the spot market.

Some firms may attempt to minimize fixed operating costs—for example, through outsourcing or flexible contracts with workers and suppliers.

Firms whose revenue/profit may be impacted by fluctuations in materials prices may also use more conservative capital structure policies, with relatively little debt and therefore smaller fixed financing obligations compared with firms that are less sensitive to such fluctuations.

Questions 4 and 5 expand on the earlier example of business model evolution in the hotel and travel industry.

4. Describe the differences in features between the hotel business model and the home-sharing business model.

Solution:

Many hotels use a franchise model in which franchisees have a tightly defined and exclusive relationship with a franchisor to operate under a specific

brand with proprietary products and processes. The franchisor earns a royalty on the franchisee's sales.

Homesharing follows an Online Travel Agency (OTA) business model and has challenged and disrupted the traditional hotel model by enabling homeowners and hosts to supply a variety of temporary, often unique, accommodations.

5. Explain why there might be so many fewer OTA companies than hotel companies.

Solution:

One reason why there might be so many fewer OTA companies than hotel companies is that OTA companies are aggregators that benefit much more from network effects than hotel companies. "Network effects" refers to the exponential increase in value to a network's users as the number of its users grows. A large network is valuable to its users in large part because it is used by so many people. As more users join the network, more merchants are attracted to the network, which in turn attracts more users. Hence, there are fewer OTA companies and each one attracts many users.

Network business models also often include crowdsourcing, where users contribute directly to a product or service. These businesses facilitate "user communities" that enable voluntary collaboration between users of a product via customer reviews and feedback and require only a small amount of moderation and oversight by the company.

PRACTICE PROBLEMS

1. The sequence of processes involved in the creation of a product, both within and external to a firm, including all the steps involved in producing a physical product and delivering it to the end customer, regardless of whether those steps are performed by a single firm, is referred to as the:
 - A. value chain.
 - B. supply chain.
 - C. business model.

The following information relates to questions 2-5

An analyst is reviewing investor presentations from the management teams of two companies with unconventional business models: HealthyPet and DiaSera. HealthyPet is a pet medical insurer that has a differentiated approach in a business dominated by incumbent property & casualty insurers, for which pet insurance is a niche business relative to business, home, and auto insurance lines. HealthyPet targets the high-income, young, urban, busy professional pet owner segment. It bundles coverage for owners of multiple pets, including exotic pets that incumbents are typically reluctant to insure. The industry incumbents sell insurance policies that reimburse pet owners for a percentage of veterinarian and other medical costs incurred, subject to restrictions and limits. HealthyPet, however, pays veterinarians directly for pet medical costs. It has a preferred network of veterinarians it recommends and for which it negotiates lower prices, but policyholders face relatively few restrictions. It sells through veterinarian referrals and boutique pet stores to maintain an image of exclusivity and prestige and maintains an online storefront for customer convenience. It avoids mass market retail to protect its image. It charges more than its competitors for monthly insurance premiums because it is a better product. The pricing has worked so far because HealthyPet has a strong brand and a distinctiveness that its customers value.

DiaSera designs, makes, and sells a medical device that delivers insulin to people with insulin-dependent diabetes known as an insulin pump. DiaSera's pump is differentiated from those of its competitors in its design and operation; it is far smaller and more aesthetically pleasing than competitors' pumps. It is a single, small device adhered to a user's skin, while competitors' pumps consist of separate handheld controllers attached to a delivery device on a user's skin with tubing.

Insulin pumps are used primarily by people with Type 1 diabetes, which is a smaller market that has complex medical needs, including close management of insulin. The insulin pump market is complex, with several competitors; complement products, such as insulin monitoring devices; and an inexpensive substitute: using multiple daily injections of insulin.

DiaSera is looking to expand its customer reach to include Type 2 diabetics who are on multiple daily insulin injections, which is a market several times the size of the Type 1 diabetics market. DiaSera's pump product is priced at a small premium to competitors. Management says that given significant economies of scale in manufacturing, unit costs will fall substantially as the customer base grows and,

even with unchanged pricing, margins will rise significantly. Besides the differentiated product design, the company also offers substantial customer service from highly trained nurses both before and after the sale. Access to customer service is available 24/7 and does not have any additional cost to the customer.

DiaSera makes direct sales to customers and markets to both customers and physicians, because customers must receive a prescription for the pump from a physician before purchase. Products are shipped directly to customers' homes.

2. Complete the grid of business model features for HealthyPet.

Customers

Products

Channels

Pricing strategy

3. Complete the table of business model features for DiaSera.

Customers

Products

Channels

Pricing strategy

4. Discuss key risks, opportunities, and questions regarding the HealthyPet business model.
5. Discuss key risks, opportunities, and questions regarding DiaSera's business model.
-

SOLUTIONS

1. B is correct. A company's supply chain is the network or system inside and outside the company involved in producing a product or service and delivering it to an end user.

A is incorrect because *value chain* refers to the systems and processes within a firm that create value for its customers. It is the "how" aspect of a business model.

C is incorrect because the business model is a description of how a business works. It includes descriptions of the core customer base, the product or service that the business offers, the key resources and assets the business uses, and the main partners and suppliers of the business.

2.

Customers	• High-income, young, urban, busy professional pet owners • Own multiple pets and exotic pets
Products	• Insurance policy for pets that are sick or injured • Provides peace of mind to customers • Handles billing directly with veterinarians
Channels	• Veterinarian referrals • Boutique pet stores, online storefront
Pricing strategy	• Premium pricing because it is a premium product • Monthly premiums, similar to subscription

3.

Customers	• Diabetics who need insulin • Expanding customer base to include Type 2 diabetics who are on multiple daily insulin injections
Products	• Differentiated insulin pump for diabetics • Substantial customer service over the phone from highly trained experts both before and after sales • Complex market with complements and substitutes
Channels	• Direct sales to customers • Maintain close relationship with customers • Product shipped directly to customers
Pricing strategy	• Bundling • Premium pricing because it is a premium product and with service

4. There are several apparent risks to HealthyPet's business model. It is not clear that their offering is sufficiently differentiated to build a large-enough customer base to provide the diversification that an insurance company depends on (insurance requires a large pool of policyholders such that there is enough premiums to cover losses). It may incur an adverse selection problem in covering exotic pets because they may be uneconomical to insure as evidenced by the reluctance of established companies to insure them. Finally, if its model is successful, it will likely face competition in the form of imitators, possibly from the incumbent insurers because it is probably possible for them to copy the model of pay veterinarians directly.

HealthyPet could see opportunity in building a loyal base of customers and a loyal base of veterinarians. Its image of prestige, premium service, and not needing

to worry when a pet gets sick could appeal to many pet owners.

Questions include how difficult it would be for other insurers to copy the business model, how HealthyPet plans to establish relationships with veterinarians and how many it has and needs, and whether relationships with veterinarians can be exclusive. It is also questionable whether referrals and boutique pet stores will deliver a sufficient flow of new customers to support the business or whether HealthyPet will instead need to invest in large advertising campaigns directly to consumers.

5. A major risk is the possible incompatibility between DiaSera's pricing strategy and its emphasis on customer service. It is priced only slightly higher than parity with competitors but aims to provide substantially better customer service by using highly trained experts. If customer growth and sales disappoint or take longer than expected, the economies of scale in manufacturing will as well, potentially imperiling profitability or forcing management to raise prices. A second major risk is targeting Type 2 diabetics who have historically not used insulin pumps. While DiaSera's insulin pump seems more convenient than multiple daily injections of insulin, it is more expensive and requires customers to navigate a potentially complicated prescription, purchasing, and service scenario. DiaSera management should discuss key factors that give it confidence in the strategy—such as a segment of customers in the Type 2 market who have tried a pump before, patients who are younger and more likely to try a new product—and establish relationships with key physicians who can recommend the product to patients.

The clear major opportunities are market share gains in Type 1 diabetes from inferior competitor products and the new market opportunity of Type 2 diabetics who require multiple daily injections. If competitors have not segmented the market to explicitly target this cohort, DiaSera could realize a competitive advantage.

Key questions include details on its manufacturing strategy, such as estimating unit costs or gross margins at different levels of volume, how experienced the manufacturing management and staff are in this setting, to what extent the company owns the manufacturing resources, and whether there are key suppliers it relies on. Additionally, an analyst will have to develop an outlook for market penetration and sales based on customer segmenting, historical data, precedent product launches, and realistic expectations for customer demand at the current price point. Finally, additional details on how many service professionals are needed per number of customers and at what cost will be essential to modeling operating costs.

Financial Statement Analysis

LEARNING MODULE

1

Introduction to Financial Statement Analysis

by Elaine Henry, PhD, CFA, J. Hennie van Greuning, DCom, CFA, and Thomas R Robinson, PhD, CFA, CAIA.

Elaine Henry, PhD, CFA, is at Stevens Institute of Technology (USA). J. Hennie van Greuning, DCom, CFA, is at BIBD (Brunei). Thomas R. Robinson, PhD, CFA, CAIA, Robinson Global Investment Management LLC, (USA).

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe the steps in the financial statement analysis framework
☐	describe the roles of financial statement analysis
☐	describe the importance of regulatory filings, financial statement notes and supplementary information, management's commentary, and audit reports
☐	describe implications for financial analysis of alternative financial reporting systems and the importance of monitoring developments in financial reporting standards
☐	describe information sources that analysts use in financial statement analysis besides annual and interim financial reports

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

1

INTRODUCTION

Financial analysis is the process of interpreting and evaluating a company's performance and position in the context of its economic environment. Financial analysis is used by analysts to make decisions and recommendations such as whether to invest in a company's debt or equity securities and at what price. A debt investor is concerned about a company's ability to pay interest and to repay the principal lent, while an equity investor is interested in a company's profitability and per-share value. Overall, a central focus of financial analysis is evaluating the company's ability to earn a return on its capital that is at least equal to the cost of that capital, to profitably grow its operations, and to generate enough cash to meet obligations and pursue opportunities.

Financial analysis starts with the information found in a company's financial reports. These financial reports include audited financial statements, additional disclosures required by regulatory authorities, and any accompanying (unaudited) commentary by management. Analysts supplement their analysis of a company's financial statements with industry and company research.

LEARNING MODULE OVERVIEW



- Financial analysis for a company often includes obtaining an understanding of the target company's business model, financial performance, financial position, and broader information about the economic environment and the industry in which the company operates. When analytical tasks are not well defined, the analyst may need to make decisions about the approach, the tools, the data sources, the format for reporting the results, and the relative importance of different aspects of the analysis.
- Financial analysis will include evaluating financial results, and structuring and scaling data to facilitate comparisons by calculating percentages, changes, and ratios. Answers to analytical questions often rely not just on numerical results but also on the analyst's interpretation of the numerical results to support a conclusion or recommendation.
- The role of financial statement analysis is to form expectations about a company's future performance, financial position, and risk factors for the purpose of making investment, credit, and other economic decisions.
- Regulatory authorities require publicly traded companies to prepare financial reports in accordance with specified accounting standards and other securities laws and regulations. An example of such a regulatory authority is the Securities and Exchange Commission in the United States.
- Other organizations exist without explicit regulatory authority and develop reporting standards, facilitate cooperation, and advise governments. Examples include the International Organization of Securities Commissions, the European Securities Committee, and the European Securities and Market Authority.
- Sources of information for analysts and investors include standardized forms that are filed with regulatory authorities, disclosures made in notes, supplementary schedules, and management commentary that accompany financial statements, and audit reports. In an audit report, an independent auditor expresses an opinion on whether the

information in the audited financial statements fairly presents the financial position, performance, and cash flows of the company in accordance with a specified set of accounting standards.

- Despite increasing convergence over time, differences still exist between IFRS (International Financial Reporting Standards) and US GAAP (Generally Accepted Accounting Principles) that affect financial reporting. Analysts must be aware of areas where accounting standards have not converged.
- In addition to information required by regulatory authorities, issuers also communicate through earnings calls, investor day events, press releases, company websites, and company visits. Analysts may also get information by speaking with management, investor relations, and other company personnel.
- Third-party sources for additional information include industry whitepapers, analyst reports, economic information from governments, general and industry-specific news outlets, and electronic data platforms. Analysts also use surveys, conversations, and product evaluations to generate their own information.

FINANCIAL STATEMENT ANALYSIS FRAMEWORK

2



describe the steps in the financial statement analysis framework

Analysts work in a variety of positions within the investment management industry. Some are equity analysts whose main objective is to evaluate potential investments in a company's equity securities as a basis for deciding whether a prospective investment is attractive and what an appropriate purchase price might be. Others are credit analysts who evaluate the creditworthiness of a company to decide whether (and on what terms) a debt investment should be made or what credit rating should be assigned. Analysts may also be involved in a variety of other tasks, such as evaluating the performance of a subsidiary company, evaluating a private equity investment, or finding stocks that are overvalued for purposes of taking a short position.

Exhibit 1 presents a generic framework for financial statement analysis used in these various roles.

Exhibit 1: Financial Statement Analysis Framework

Phase	Sources of Information	Output
Articulate the purpose and context of the analysis.	▪ The nature of the analyst's function, such as evaluating an equity or debt investment or issuing a credit rating. ▪ Communication with client or supervisor on specific needs and concerns. ▪ Institutional guidelines related to developing specific work product.	▪ Statement of the purpose or objective of analysis. ▪ A list (written or unwritten) of specific questions to be answered by the analysis. ▪ Nature and content of report to be provided. ▪ Timetable and budgeted resources for completion.
Collect data.	▪ Financial statements, other financial data, questionnaires, and industry/economic data. ▪ Discussions with issuer investor relations, management, suppliers, customers, competitors, and company or industry experts. ▪ Company site visits (e.g., to production facilities or retail stores).	▪ Financial statements and other quantitative data in a usable form, such as a spreadsheet. ▪ Completed questionnaires, if applicable.
Process data.	Data from the previous phase.	▪ Adjusted financial statements. ▪ Common-size statements. ▪ Ratios and graphs.
Analyze/interpret the data.	Input data as well as processed data.	▪ Analytical results. ▪ Forecasts. ▪ Valuations.
Develop and communicate conclusions and recommendations (e.g., with an analysis report).	▪ Analytical results and previous reports. ▪ Institutional guidelines for published reports.	▪ Analytical report answering questions posed in Phase 1. ▪ Recommendation regarding the purpose of the analysis, such as whether to make an investment or extend credit.
Follow-up.	Information gathered by periodically repeating the previous steps as necessary to determine whether changes to holdings or recommendations are necessary.	▪ Comparison of actual to expected results ▪ Revised forecasts ▪ Updated reports and recommendations.

The following sections discuss the individual phases of financial statement analysis.

Articulate the Purpose and Context of the Analysis

Before undertaking any analysis, it is essential to understand the purpose of the analysis. An understanding of the purpose is particularly important in financial statement analysis because of the numerous available techniques and the substantial amount of data.

Some analytical tasks are well defined, in which case articulating the purpose of the analysis requires little decision making by the analyst. For example, a periodic credit review of an investment-grade debt portfolio or an equity analyst's quarterly report on a particular company may be guided by institutional norms such that the purpose of the analysis is given. Furthermore, the format, procedures, or sources of information may also be given.

For other analytical tasks, articulating the purpose of the analysis requires the analyst to make decisions about the approach, the tools, the data sources, the format in which to report the results of the analysis, and the relative importance of different aspects of the analysis.

When facing a substantial amount of data, a less experienced analyst may be tempted to start calculating ratios without considering what is relevant for the decision at hand. It is generally advisable to resist this temptation and thus avoid unnecessary or pointless efforts. Consider the questions: If you could have all the calculations and ratios completed instantly, what question would you be able to answer? What decision would your answer support?

The analyst should also define the context at this stage. Who is the intended audience? What is the deliverable—for example, a final report explaining conclusions and recommendations? What is the time frame (i.e., when is the report due)? What resources and resource constraints are relevant to completion of the analysis? Again, the context may be predefined (i.e., standard and guided by institutional norms).

Having clarified the purpose and context of the financial statement analysis, the analyst should next compile the specific questions to be answered by the analysis. For example, if the purpose of the financial statement analysis (or, more likely, a stage of a larger analysis) is to compare the historical performance of three companies operating in a particular industry, specific questions would include the following: What has been the relative growth rate of the companies, and what has been their relative profitability?

Collect Data

Next, the analyst obtains information required to answer the specific questions. A key part of this step is obtaining an understanding of the target company's business model, financial performance, and financial position (including trends over time and relative to peer companies). Financial statement data alone may be adequate in some cases. For example, to screen a large number of companies to find those with a minimum level of historical profitability or sales growth, financial statement data alone would be adequate. But to address more in-depth questions, such as why and how one company performed better or worse than its competitors, additional information would be required.

Furthermore, information on the economy and industry is necessary to understand the environment in which the company operates. Analysts often take a top-down approach whereby they (1) gain an understanding of an issuer's macroeconomic environment, such as prospects for growth in the economy and inflation; (2) analyze the prospects of the industry in which the company operates, based on the expected macroeconomic environment; and (3) determine the prospects for the company given the expected industry and macroeconomic environments. For example, an analyst may need to forecast future growth in earnings for a company. Past company data provide the platform for statistical forecasting; however, an understanding of economic and industry conditions and an outlook for them can improve the analyst's ability to make forecasts.

Process Data

After obtaining the requisite financial and other information, the analyst processes these data using appropriate analytical tools. For example, processing the data may involve computing ratios or growth rates; preparing common-size financial statements; creating charts; performing statistical analyses, such as regressions or Monte Carlo simulations; making forecasts; performing valuations; performing sensitivity

analyses; or using any other analytical tools or combination of tools that are available and appropriate for the task. A comprehensive financial analysis at this stage may include the following:

- Reading and evaluating financial results for each company being analyzed. This includes understanding any factors that may affect comparability between companies, such as differences in business models, operating decisions (e.g., leasing versus purchasing fixed assets), accounting policies (e.g., when to report revenue on the income statement), and tax jurisdictions.
- Making any needed adjustments to the financial statements or using alternative measures to facilitate comparison. Note that commonly used databases do not always make such analyst adjustments.
- Preparing or collecting common-size financial statement data (which scale data to directly reflect percentages [e.g., of sales] or changes [e.g., from the prior year]) and financial ratios (which are measures of various aspects of corporate performance based on financial statement elements. Analysts can use these to evaluate a company's relative profitability, liquidity, leverage, efficiency, and valuation in relation to past results or peers.

Analyze/Interpret the Data

Once the data have been processed, the next step—critical to any analysis—is to interpret the output. The answer to a specific question is seldom the numerical answer alone. Rather, the answer relies on the analyst's interpretation of the output, and the use of this interpreted output to support a conclusion or recommendation. The answers to the specific analytical questions may themselves achieve the underlying purpose of the analysis, but usually, a conclusion or recommendation is required. For example, an equity analysis may involve forecasts of earnings, free cash flow, and a range of fair value estimates that would be used to issue a buy, hold, or sell recommendation. A credit analyst may also create forecasts of free cash flow, interest coverage, and leverage in support of an investment decision.

Develop and Communicate Conclusions and Recommendations

Communicating the conclusion or recommendation in an appropriate format is the next step. The appropriate format will vary by analytical task, by institution, or by audience. For example, an equity analyst's report for external distribution would typically include the following components:

- summary and investment conclusion;
- industry overview and competitive analysis;
- financial statement model, potentially with several scenarios;
- valuation; and
- investment risks.

The contents of reports may also be specified by regulatory agencies or professional standards. For example, the CFA Institute *Standards of Practice Handbook* (*Handbook*) dictates standards that must be followed in communicating recommendations. According to the *Handbook*:

Standard V(B) states that members and candidates should communicate in a recommendation the factors that were instrumental in making the investment recommendation. A critical part of this requirement is to

distinguish clearly between opinions and facts. In preparing a research report, the member or candidate must present the basic characteristics of the security(ies) being analyzed, which will allow the reader to evaluate the report and incorporate information the reader deems relevant to his or her investment decision making process.¹

The *Handbook* requires that limitations to the analysis and any risks inherent to the investment be disclosed. Furthermore, it requires that any report include elements important to the analysis and conclusions so that readers can evaluate the conclusions themselves.

Follow-Up

The process does not end with the report. If an equity investment is made or a credit rating is assigned, periodic review is required to revise forecasts and recommendations based on the receipt of new information. In the case of a rejected investment, subsequent analyses may still be required should the security price or business conditions change. Follow-up may involve repeating all the previous steps in the process on a periodic basis.

SCOPE OF FINANCIAL STATEMENT ANALYSIS

3



describe the roles of financial statement analysis

The role of financial statement analysis is to use financial reports prepared by companies, combined with other information, to evaluate the past, current, and potential performance and financial position of a company for the purpose of making investment, credit, and other economic decisions. Managers within a company perform financial analysis to make operating, investing, and financing decisions but do not exclusively rely on analysis of related financial statements because they have access to nonpublic financial information.

In evaluating financial reports, analysts typically have a specific economic decision in mind. Examples of these decisions include the following:

- Evaluating an equity investment for inclusion in a portfolio.
- Valuing a security for making an investment recommendation to others.
- Determining the creditworthiness of a company to decide whether to extend a loan to the company and if so, what terms to offer.
- Assigning a debt rating to a company or bond issue.
- Deciding whether to make a venture capital or other private equity investment.
- Evaluating a merger or acquisition candidate.

These decisions demonstrate certain themes in financial analysis. In general, analysts seek to examine the past and current performance and financial position of a company to form expectations about its future performance and financial position. Analysts are also concerned about factors that affect the risks to a company's future performance and financial position. An examination of performance can include an

¹ *Standards of Practice Handbook*, 11th ed. (Charlottesville, VA: CFA Institute, 2014), p. 169.

assessment of a company's profitability (the ability to earn a profit from delivering goods and services) and its ability to generate positive cash flows (cash receipts in excess of cash disbursements).

Exhibit 2 shows how news coverage of corporate earnings announcements places corporate results in the context of analysts' expectations. Panel A shows the earnings announcement, and Panel B shows a sample of the news coverage of the announcement. Earnings are also frequently used by analysts in valuation. For example, an analyst may value shares of a company by comparing its price-to-earnings ratio (P/E) to the P/Es of peer companies or may use forecasted future earnings as direct or indirect inputs into discounted cash flow models of valuation.

Exhibit 2: An Earnings Release and News Media Comparison with Analysts' Expectations

Panel A: Excerpt from Sea Limited's Earnings Release

Singapore, August 16, 2022 – Sea Limited (NYSE: SE) ("Sea" or the "Company") today announced its financial results for the second quarter ended June 30, 2022.

"As we navigate the current environment of increased macro uncertainty with that same nimble and decisive approach, we believe it is vital to be thoughtful, prudent, and disciplined. While we have strong resources and are well on-track to achieve our self-sufficiency targets, we are nevertheless rapidly prioritizing profitability and cash flow management. We are confident that this focus, combined with our demonstrated ability to execute, our scale and leadership, and our proven business models, will position us for long-term sustained success."

Second Quarter 2022 Highlights:

- Total GAAP revenue was US\$2.9 billion, up 29.0% year-on-year.
- Total gross profit was US\$1.1 billion, up 17.1% year-on-year.
- Total net income (loss) was US\$(931.2) million compared to US\$(433.7) million for the second quarter of 2021. Total net loss excluding share-based compensation and impairment of goodwill was US\$(569.8) million compared to US\$(321.2) million for the second quarter of 2021.
- Total adjusted EBITDA was US\$(506.3) million compared to US\$(24.1) million for the second quarter of 2021.
- E-commerce Segment:
 - GAAP revenue was US\$1.7 billion, up 51.4% year-on-year. Based on constant currency assumptions, GAAP revenue was up 56.2% year-on-year.
 - Gross orders totaled 2.0 billion, an increase of 41.6% year-on-year.
 - Gross profit margin for e-commerce continued to improve sequentially quarter-on-quarter, as we have seen faster growth of transaction-based fees and advertising income, which have higher profit margin compared to product revenue and revenue generated from other value-added services.

E-commerce Full Year 2022 Guidance Update:

In our efforts to adapt to increasing macro uncertainties, we are proactively shifting our strategies to further focus on efficiency and optimization for the long-term strength and profitability of the e-commerce business. Given this

strategic shift, we will be suspending e-commerce GAAP revenue guidance for the full year 2022. We believe such efforts will further strengthen our ability to better capture the long-term growth opportunities in our markets, which we remain highly positive about.

Source: Sea Limited, "Sea Limited Reports Second Quarter 2022 Results," accessed 16 August 2022, <https://cdn.sea.com/webmain/static/resource/seagroup/website/investornews/2Q2022/uXxGiCr8oTGxOFTPhBUB/2022.08.16%20Sea%20Second%20Quarter%202022%20Results.pdf>.

Panel B: Excerpt from News Article: Sea Limited Reports Mixed Results, Suspends Revenue Guidance

Singapore-based Sea Limited (SE) reported second-quarter results early Tuesday that missed on revenue but beat on earnings. The company, however, said it will suspend guidance for its e-commerce unit, which accounts for about 60% of company revenue.

The company reported revenue of \$2.9 billion, missing estimates of \$2.98 billion. It lost 61 cents a share, better than the estimated loss of \$1.14 a share, according to FactSet.

SE stock plunged 14.3% during afternoon action on the stock market today.

Sea has one of the largest e-commerce and digital entertainment platforms in the Southeast Asia region. It also provides financial services.

The company said its decision to suspend revenue guidance was driven by a highly volatile and unpredictable macro environment.

"We think the right thing to do in this time of continuing heightened macro volatility is to prioritize efficiency and self-sufficiency," Chief Executive Forrest Li said in written remarks in the Sea Limited earnings report.

Sea's gaming unit, called Garena, accounts for about 31% of revenue.

"We are in an environment of increased macro uncertainty, with rising inflation, rising interest rates, local currency depreciations against the U.S. dollar, and ongoing reopening trends," said Li. "In this environment, being agile and adaptable is even more crucial to the long-term success of our business."

SE stock is down about 62% this year.

Source: Brian Deagon, "Sea Limited Reports Mixed Results, Suspends Revenue Guidance," 16 August 2022, <https://www.investors.com/news/technology/se-stock-drops-on-second-quarter-results-earnings/>.

Analysts are also interested in the financial position of a company, particularly for credit analysis, as depicted in Exhibit 3. Panel A of the exhibit is an excerpt from an August 2022 T-Mobile's press release highlighting a series of credit rating upgrades that the company received from the three major rating agencies. Panel B of the exhibit is an excerpt from a July 2022 announcement from Moody's Investor Service about its upgrade of T-Mobile's credit rating.

Exhibit 3: Credit Rating Upgrade for T-Mobile

Panel A: Excerpt from Announcement by T Mobile

T-Mobile Secures First-Ever Full Investment Grade Rating

BELLEVUE, Wash.--(BUSINESS WIRE)-- T-Mobile US, Inc. (NASDAQ: TMUS) today announced that following an investment grade issuer rating from S&P Global Ratings (S&P) – the third it has received from credit rating agencies – the company now has its first-ever full investment grade rating. S&P has

assigned the Company a BBB- with positive outlook. This follows the company securing a Baa3 rating with a stable outlook from Moody's and a BBB- rating with a positive outlook from Fitch.

This full investment grade rating comes as a result of T-Mobile's successful operational and financial performance, which is consistently demonstrated through strong subscriber growth and the company's ability to translate that into increasing free cash flow.

"Achieving a full investment grade rating is an important milestone for T-Mobile that reflects the leading credit rating agencies' positive outlook on our Un-carrier leadership strategy that is rooted in an unwavering focus on putting customers first," said Peter Osvaldik, T-Mobile chief financial officer. "This 'clean sweep' in upgrades provides T-Mobile with the ability to unlock full access to the deep investment grade debt markets, which will further fuel our growth and momentum toward our mission of being the very best at connecting customers to their world."

Source: "T-Mobile Secures First-Ever Full Investment Grade Rating," 5 August 2022, <https://investor.t-mobile.com/events-and-presentations/news/news-details/2022/T-Mobile-Secures-First-Ever-Full-Investment-Grade-Rating/default.aspx>.

Panel B: Excerpt from Moody's Announcement About Rating Action on T-Mobile

Rating Action: Moody's upgrades T-Mobile to Baa3; outlook stable

New York, July 20, 2022 -- Moody's Investors Service (Moody's) upgraded T-Mobile USA, Inc.'s (T-Mobile) senior unsecured debt rating to Baa3 from Ba2 and affirmed the Baa3 rating on the company's existing senior secured notes and senior secured revolving credit facility.

Moody's has also withdrawn T-Mobile's Ba1 corporate family rating, Ba1-PD probability of default rating and SGL-1 speculative grade liquidity rating. With this rating action, Moody's changed T-Mobile's ratings outlook to stable from positive.

The ratings upgrade reflects T-Mobile's accelerated achievement of higher than expected operating cost synergies following its April 2020 merger with Sprint, significant and nearly complete network and operations integration and high visibility into the company's steady path towards sustained debt leverage (Moody's adjusted) below 3.75x. T-Mobile's sizable operating scale, high speed 5G coverage footprint, substantial upside growth potential in historically under-indexed rural and enterprise end market segments, solid incremental revenue growth adjacencies in fixed wireless access, extensive asset base and solid industry market position support continued subscriber growth, EBITDA margin expansion and ramping free cash flow over the next 12-18 months. The company's financial policy, which prudently focuses on network infrastructure investments to support market share growth, remains an important driver of the credit profile going forward. Moody's views network investments, including spectrum investments, as supportive of the business profile.

The stable outlook reflects Moody's expectation for T-Mobile's continued subscriber and service revenue growth, EBITDA margin expansion, debt leverage (Moody's adjusted) declining steadily towards and sustained around 3.75x and rising free cash flow.

Source: "Moody's Upgrades T-Mobile to Baa3; Outlook Stable," 20 July 2022, https://www.moody.com/research/Moodys-upgrades-T-Mobile-to-Baa3-outlook-stable--PR_468077.

In conducting financial analysis of a company, the analyst will regularly refer to the company's financial statements, financial notes, and supplementary schedules as well as a variety of other information sources. The next lesson introduces commonly used information sources.

REGULATED SOURCES OF INFORMATION

4

- ☐ describe the importance of regulatory filings, financial statement notes and supplementary information, management's commentary, and audit reports

Regulatory authorities require publicly traded issuers to prepare financial reports in accordance with specified accounting standards and other securities laws and regulations. For example, in Switzerland, Swiss-based companies listed on the main board of the Swiss Exchange must prepare their financial statements in accordance with either IFRS (International Financial Reporting Standards) or US GAAP (Generally Accepted Accounting Principles) if they are multinational.² While jurisdictions differ in their approach to securities regulations and corporate reporting standards, regulators of jurisdictions that oversee more than 95 percent of world's financial markets are members of the International Organization of Securities Commissions (IOSCO) and share objectives and principles, thereby creating a degree of global uniformity.

International Organization of Securities Commissions

Although technically not a regulatory authority, IOSCO regulates a significant portion of the world's financial capital markets. This organization was formed in 1983 and consists of ordinary members, associate members, and affiliate members. Ordinary members are the securities commission or similar governmental regulatory authority with primary responsibility for securities regulation in the member country.³ The members regulate more than 95 percent of the world's financial capital markets in more than 115 jurisdictions, and securities regulators in emerging markets account for 75 percent of its ordinary membership.

IOSCO's comprehensive set of *Objectives and Principles of Securities Regulation* is updated as required and is recognized as an international benchmark for all markets. The principles of securities regulation are based upon three core objectives:⁴

- protecting investors;
- ensuring that markets are fair, efficient, and transparent; and
- reducing systemic risk.

² "Financial Reporting Framework in Switzerland," Deloitte, <https://www.iasplus.com/en/jurisdictions/europe/switzerland>.

³ Examples include the China Securities Regulatory Commission, Egyptian Financial Supervisory Authority, Securities and Exchange Board of India, Kingdom of Saudi Arabia Capital Market Authority, and Banco Central del Uruguay.

⁴ *Objectives and Principles of Securities Regulation*, IOSCO, May 2017.

IOSCO's principles are grouped into 10 categories, including principles for regulators, for enforcement, for auditing, and for issuers, among others. Within the category "Principles for Issuers," two principles relate directly to financial reporting:

- There should be full, accurate, and timely disclosure of financial results, risk, and other information that is material to investors' decisions.
- Accounting standards used by issuers to prepare financial statements should be of a high and internationally acceptable quality.

Historically, regulation and related financial reporting standards were developed within individual countries and were often based on the cultural, economic, and political norms of each country. As financial markets have become more global, it has become desirable to establish comparable financial reporting standards internationally. Ultimately, laws and regulations are established by individual jurisdictions, so this also requires cooperation among regulators. Another IOSCO principle deals with the use of self-regulatory organizations (SROs), which exercise some direct oversight for their areas of competence and should be subject to the oversight of the relevant regulator and observe fairness and confidentiality.⁵

To ensure consistent application of international financial standards (such as the Basel Committee on Banking Supervision's standards and IFRS), it is important to have uniform regulation and enforcement across national boundaries. IOSCO assists in attaining this goal of uniform regulation as well as cross-border cooperation in combating violations of securities and derivatives laws.

US Securities and Exchange Commission

The US SEC has primary responsibility for securities and capital markets regulation in the United States and is an ordinary member of IOSCO. Any company issuing securities within the United States (e.g., on the New York Stock Exchange or NASDAQ), or otherwise involved in US capital markets, is subject to the rules and regulations of the SEC. The SEC, one of the oldest and most developed regulatory authorities, was created by reforms after the stock market crash of 1929 that preceded the Great Depression.

From a financial reporting and analysis perspective, the most significant statutes enforced by the SEC are the Securities Acts of 1933 and 1934 and the Sarbanes–Oxley Act of 2002.

- **Securities Act of 1933** (the 1933 Act): This law specifies the financial and other significant information that investors must receive when securities are sold, prohibits misrepresentations, and requires initial registration of all public issuances of securities.
- **Securities Exchange Act of 1934** (the 1934 Act): This law created the SEC, gave the SEC authority over all aspects of the securities industry, and empowered the SEC to require periodic reporting by companies with publicly traded securities.
- **Sarbanes–Oxley Act of 2002**: This law created the Public Company Accounting Oversight Board (PCAOB) to oversee auditors. The SEC is responsible for carrying out the requirements of the act and overseeing the PCAOB. The act addresses auditor independence (it prohibits auditors from providing certain non-audit services to the companies they audit); strengthens corporate responsibility for financial reports (it requires executive management to certify that the company's financial reports fairly present the company's condition); and requires management to report on

⁵ *Objectives and Principles of Securities Regulation*, IOSCO, May 2017.

the effectiveness of the company's internal control over financial reporting (including obtaining external auditor confirmation of the effectiveness of internal control).

Companies comply with these acts principally through filing standardized forms created by the SEC and by responding to and complying with specific comments on their filings by the SEC staff. More than 50 different types of SEC forms are used to satisfy reporting requirements; the discussion herein is limited to those forms most relevant for financial analysts.

Most of the SEC filings are required to be made electronically, so filings that an analyst would be interested in can be retrieved online from one of many websites, including an issuer's investor relations website and the SEC's own website. Some filings are required on the initial offering of securities, whereas others are required on a periodic basis thereafter. The following are some of the more common filings used by analysts.

- **Securities Offerings Registration Statement:** The 1933 Act requires companies offering securities to file a registration statement. New issuers as well as previously registered companies that are issuing new securities are required to file these statements. Required information and the precise form vary depending upon the size and nature of the offering. Typically, required information includes (1) disclosures about the securities being offered for sale, (2) the relationship of these new securities to the issuer's other capital securities, (3) the information typically provided in the annual filings, (4) recent audited financial statements, and (5) risk factors involved in the business. Interim unaudited financial statements are also provided if the statement is filed three months or more after a fiscal year end.
- **Forms 10-K, 20-F, and 40-F:** Companies are required to file these forms *annually*. Form 10-K is for US registrants, Form 40-F is for certain Canadian registrants, and Form 20-F is for all other non-US registrants. These forms require a comprehensive overview, including information concerning a company's business, risk factors, financial disclosures, legal proceedings, and information related to management. The financial disclosures include audited financial statements and notes, management discussion and analysis (MD&A) of the company's financial condition and results of operations, and auditors' reports.
- **Annual Report:** In addition to the SEC's annual filings (e.g., Form 10-K), most companies prepare an annual report to shareholders. This is not a requirement of the SEC. The annual report is usually viewed as one of the most significant opportunities for a company to present itself to shareholders and other external parties; accordingly, it is often a highly polished marketing document with photographs, an opening letter from the chief executive officer, financial data, market segment information, research and development activities, and future corporate goals. In contrast, the Form 10-K is a more legal type of document with minimal marketing emphasis. Although the perspectives vary, a company's annual report and its Form 10-K have considerable overlap. Some companies prepare only Form 10-K or publish an annual report that consists of a few pages of material and a copy of the 10-K.
- **Proxy Statement/Form DEF-14A:** The SEC requires that shareholders of a company receive a proxy statement before a shareholder meeting. A proxy is an authorization from the shareholder giving another party the right to cast its vote. Shareholder meetings are held at least once a year, but any special meetings also require a proxy statement. Proxies, especially annual meeting

proxies, contain information that is often useful to financial analysts. Such information typically includes proposals that require a shareholder vote, details of security ownership by management and principal owners, biographical information on directors, and disclosure of executive compensation. Proxy statement information is filed with the SEC as Form DEF-14A.

- **Forms 10-Q and 6-K:** Companies are required to submit these forms for interim periods (quarterly for US companies on Form 10-Q, and semiannually for many non-US companies on Form 6-K). The filing requires certain financial information, including unaudited financial statements and an MD&A for the interim period covered by the report. Additionally, if certain types of non-recurring events—such as the adoption of a significant accounting policy, commencement of significant litigation, or a material limitation on the rights of any holders of any class of registered securities—take place during the period covered by the report, these events must be included in the Form 10-Q report. Companies may provide the 10-Q report to shareholders or may prepare a separate, abbreviated, quarterly report to shareholders.

KNOWLEDGE CHECK



1. In September 2017, Sea Ltd, the Singapore-based technology company, filed a registration statement with the US SEC to register its initial public offering of securities (American Depositary Shares, each representing one Class A Ordinary Share) on the New York Stock Exchange. In addition to a large amount of financial information, the registration statement provided over 50 pages of discussion on Sea Ltd.'s business and industry.

Which of the following is *most likely* to have been included in Sea's registration statement?

- A. Underwriters' fairness opinion of the offering
- B. Assessment of risk factors involved in the business
- C. Projected cash flows and earnings for the business

Solution:

B is correct. Information provided by companies in registration statements typically includes disclosures about the securities being offered for sale; the relationship of these new securities to the issuer's other capital securities; the information typically provided in the annual filings; recent audited financial statements; and risk factors involved in the business. Companies provide information useful in developing projected cash flows and earnings but do not typically include these in the registration statement, nor do they provide opinions of the underwriters.

A company or its officers make other SEC filings—either periodically, or, if significant events or transactions have occurred, in between the periodic reports noted previously. By their nature, these forms sometimes contain timely information that may have significant valuation implications.

- **Form 8-K:** In addition to filing annual and interim reports, SEC registrants must report material corporate events on a more current basis. Form 8-K (6-K for non-US registrants) is the “current report” companies must file with the SEC to announce such major events as acquisitions or disposals of

corporate assets, changes in securities and trading markets, matters related to accountants and financial statements, corporate governance and management changes, and Regulation FD disclosures.⁶

- **Forms 3, 4, 5, and 144:** Forms 3, 4, and 5 are required to report beneficial ownership of securities. These filings are required for any director or officer of a registered company as well as beneficial owners of greater than 10 percent of a class of registered equity securities. Form 3 is the initial statement, Form 4 reports changes, and Form 5 is the annual report. Form 144 is notice of the proposed sale of restricted securities or securities held by an affiliate of the issuer. These forms can be used to examine purchases and sales of securities by officers, directors, and other affiliates of the company, who collectively are regarded as corporate insiders.
- **Form 11-K:** This is the annual report of employee stock purchase, savings, and similar plans. It might be of interest to analysts for companies with significant employee benefit plans because it contains more information about these plans than disclosed in the company's financial statements.

In jurisdictions other than the United States, similar legislation exists for the purpose of regulating securities and capital markets. Regulatory authorities are responsible for enforcing regulation, and securities regulation is intended to be consistent with the IOSCO objectives described in the previous section. Within each jurisdiction, regulators will either establish or, more typically, recognize and adopt a specified set or sets of accounting standards. The regulators will also establish reporting and filing requirements. IOSCO members have agreed to cooperate in the development, implementation, and enforcement of internationally recognized and consistent standards of regulation.

Capital Markets Regulation in Europe

Each individual member state of the European Union (EU) regulates capital markets in its jurisdiction. Certain regulations, however, have been adopted at the EU level. Importantly, the EU agreed that from 2005 consolidated accounts of EU-listed companies would use International Financial Reporting Standards. The endorsement process by which newly issued IFRS are adopted by the EU reflects the balance between the individual member state's autonomy and the need for cooperation and convergence. When the IASB issues a new standard, the European Financial Reporting Advisory Group advises the European Commission on the standard, and the Standards Advice Review Group provides the Commission with an opinion about that advice. Based on the input from these two entities, the Commission prepares a draft endorsement regulation. The Accounting Regulatory Committee votes on the proposal; and if the vote is favorable, the proposal proceeds to the European Parliament and the Council of the European Union for approval.⁷

Two bodies related to securities regulation established by the European Commission are the European Securities Committee (ESC) and the European Securities and Market Authority (ESMA). The ESC consists of high-level representatives of member states and advises the European Commission on securities policy issues. ESMA is an EU cross-border supervisor established to coordinate supervision of the EU market. As noted earlier, regulation still rests with the individual member states and, therefore,

⁶ Regulation Fair Disclosure (FD) provides that when an issuer discloses material non-public information to certain individuals or entities—generally, securities market professionals such as stock analysts or holders of the issuer's securities who may trade on the basis of the information—the issuer must make public disclosure of that information. In this way, the rule aims to promote full and fair disclosure.

⁷ European Commission, [https://www.esma.europa.eu/convergence/ias-regulation#:~:text=The%20objective%20of%20the%20International,the%20European%20Union%20\(EU\).](https://www.esma.europa.eu/convergence/ias-regulation#:~:text=The%20objective%20of%20the%20International,the%20European%20Union%20(EU).)

requirements for registering shares and filing periodic financial reports vary from country to country. ESMA is one of three European supervisory authorities; the two others supervise the banking and insurance industries.

Financial Notes and Supplementary Schedules

The notes (also sometimes referred to as footnotes) that accompany the financial statements are required and often account for a large percentage of the financial disclosures made in regulatory filings. The notes provide information that is essential to understanding the information provided in the statements. Sea Ltd.'s 2021 financial statements, for example, include more than 60 pages of notes.

The notes disclose the basis of preparation for the financial statements. For example, Sea Ltd. discloses that its fiscal year corresponds to the calendar year; its financial statements are prepared in accordance with US GAAP; the statements are thousands of US dollars unless otherwise specified; and the figures have been rounded, which might give rise to minor discrepancies when they are added. Sea Ltd. also states that its financial statements are on a consolidated basis—that is, aggregating the financial records of all its subsidiaries it controls, after eliminating intercompany balances and transactions.

The notes also disclose information about the accounting policies, methods, and estimates used to prepare the financial statements. Both IFRS and US GAAP allow some flexibility in choosing among alternative policies and methods when accounting for certain items. This flexibility aims to meet the divergent needs of many businesses for reporting a variety of economic transactions. In addition to differences in accounting policies and methods, differences arise as a result of estimates needed to record and measure transactions, events, and financial statement line items.

Overall, flexibility in accounting choices is necessary because, ideally, a company will select those policies, methods, and estimates that are allowable and most relevant and that fairly reflect the unique economic environment of the company's business and industry. Flexibility can, however, create challenges for the analyst because the use of different policies, methods, and estimates reduces comparability across different companies' financial statements.

For example, if a company acquires a piece of equipment to use in its operations, accounting standards require that the cost of the equipment be reported as an expense (depreciation) by allocating its cost, less any residual value, in a systematic manner over the equipment's useful life. Accounting standards permit flexibility, however, in determining the way each year's expense is determined. Two companies may acquire similar equipment but use different methods and assumptions to record the expense over time. An analyst's ability to compare the companies' performance is hindered by the difference. Analysts must understand reporting choices to make appropriate adjustments when comparing companies' financial positions and performance.

For many companies, the financial notes and supplemental schedules provide explanatory information about every line item (or almost every line item) on the balance sheet and income statement. In addition, note disclosures include information about the following (this is not an exhaustive list):

- segment reporting;
- business acquisitions and disposals;
- contractual obligations, including both on- and off-balance sheet debt;
- financial instruments and risks arising from financial instruments;
- legal proceedings;
- related-party transactions; and
- subsequent events (i.e., events that occur after the balance sheet date).

Experience using the disclosures made by a company and its competitors typically enhances an analyst's judgment about the relative importance of different disclosures and the ways in which they can be helpful.

Business and Geographic Segment Reporting

Many companies are composed of several businesses. Although companies are not required to provide disaggregated full financial statements for all of its businesses or subsidiaries, they are required to provide some disaggregated information under both IFRS and US GAAP in the notes to financial statements by **operating segment**. An operating segment is defined as a component of a company that

- engages in activities that may generate revenue and create expenses, including a start-up segment that has yet to earn revenues;
- whose results are regularly reviewed by the company's senior management; and
- for which discrete financial information is available.

A company must disclose separate information about any operating segment that meets certain quantitative criteria—namely, the segment constitutes 10 percent or more of the combined operating segments' revenue, assets, or profit. (For purposes of determining whether a segment constitutes 10 percent or more of combined profits or losses, the criteria is expressed in terms of the absolute value of the segment's profit or loss as a percentage of the greater of (1) the combined profits of all profitable segments and (2) the absolute amount of the combined losses of all loss-making segments.) If, after applying these quantitative criteria, the combined revenue from external customers for all reportable segments combined is less than 75 percent of the total company revenue, the company must identify additional reportable segments until the 75 percent level is reached. Small segments might be combined as one if they share a substantial number of factors that define a business or geographical segment, or they might be combined with a similar significant reportable segment. Information about operating segments and businesses that are not reportable is combined in an "all other segments" category.

Companies must disclose the factors used to identify reportable segments and the types of products and services sold by each reportable segment.

For each reportable segment, the following should also be disclosed in the notes to financial statements:

- revenue, distinguishing between revenue to external customers and revenue from other segments;
- a measure of profit or loss;
- a measure of assets and liabilities (if these amounts are regularly reviewed by the company's chief decision-making officer);
- interest revenue and interest expense;
- cost of property, plant, and equipment, and intangible assets acquired;
- depreciation and amortization expense;
- other non-cash expenses;
- income tax expense or income; and
- share of the net profit or loss of an investment accounted for under the equity method.

Companies also must provide a reconciliation between the information of reportable segments and the consolidated financial statements in terms of segment revenue, profit or loss, assets, and liabilities.

A company's reporting segments can be useful as a means of quickly understanding what a company does and how and where it earns money. The segment data shown in Exhibit 4 appear in the notes to the financial statements for Sea Ltd.

Exhibit 4: Segment Reporting

Excerpts from Note 22 (Segment Reporting) of Sea Ltd's 2021 Annual Report on Form 20-F

The Company has three reportable segments, namely digital entertainment, e-commerce and digital financial services. The Chief Operating Decision Maker (CODM) reviews the performance of each segment based on revenue and certain key operating metrics of the operations and uses these results for the purposes of allocating resources to and evaluating financial performance of each segment.

Description of Reportable Segments:

Digital entertainment – Garena's platform offers mobile and PC online games and develops mobile games for the global market. Garena is the global leader in eSports, it also provides access to other entertainment content and social features, such as live streaming of gameplay, user chat and online forums.

E-commerce – Shopee's platform is a mobile-centric, social-focused marketplace. It provides users with a convenient, safe, and trusted shopping environment with integrated payment, logistics infrastructure and comprehensive seller services. Products from manufacturers and third parties are also purchased and sold directly to buyers on Shopee platform.

Digital financial services – SeaMoney provides a variety of payment services and loans to individuals and businesses. It is an important payment infrastructure supporting the Company's digital entertainment and e-commerce businesses. In addition, SeaMoney also integrates with third party merchant partners and covers a broad set of consumption use cases.

A combination of multiple business activities that does not meet the quantitative thresholds to qualify as reportable segments are grouped together as "Other services".

Segment Results for Year Ended 31 December 2021 (000s of USD)

	Digital Entertainment	E-Commerce	Digital Financial Services	Other Services	Unallocated Expenses	Consolidated
Revenue	4,320,013	5,122,959	469,774	42,444	0	9,955,190
Operating income (loss)	2,500,081	(2,766,566)	(640,422)	(177,633)	(498,520)	(1,583,060)
Non-operating loss, net						(132,124)
Income tax expense						(332,865)

Segment Results for Year Ended 31 December 2021 (000s of USD)

	Digital Entertainment	E-Commerce	Digital Financial Services	Other Services	Unallocated Expenses	Consolidated
Share of results of equity investees						5,019
Net loss						(2,043,030)

Revenue by Geography (000s of USD)

Year Ended 31 December			
Revenue:	2019	2020	2021
Southeast Asia	1,378,141	2,791,894	6,316,782
Latin America	282,618	790,308	1,850,861
Rest of Asia	489,291	655,007	1,394,342
Rest of the World	25,328	138,455	393,205
Consolidated revenue	2,175,378	4,375,664	9,955,190

From the data in Exhibit 4, an analyst can quickly see that the e-commerce segment accounted for just over 50 percent of total revenues in 2021 but generated a large operating loss, while the digital entertainment segment accounted for most of the remaining revenues and was the only profitable segment. An analyst would likely spend a majority of their time on examining the past and present, and forecasting the future results of these two segments. Similarly, an analyst would use these disclosures to understand that Southeast Asia and Latin America are the company's most important geographies.

Identifying segments requires significant judgment by management, and companies often change the definition of segments and related disclosures.

Another required disclosure is the company's reliance on any single customer. If any single customer represents 10 percent or more of the company's total revenues, the company must disclose that fact, though not the identity of that customer. From an analysts' perspective, information about a concentrated customer base can be useful in assessing the risks faced by the company.

Management Commentary or Management's Discussion and Analysis

Regulatory filings such as Form 10-K and 10-Q include a section in which management discusses a variety of issues, including the nature of the business, past results, and outlook. This section is referred to by a variety of names, including management report(ing), management commentary, operating and financial review, and MD&A.

The discussion by management is arguably one of the most useful parts of a company's annual report besides the financial statements themselves; however, other than excerpts from the financial statements, information included in the management commentary is typically unaudited. In Germany, management reporting has been required since 1931 and is audited.

To help improve the quality of the discussion by management, the International Accounting Standards Board (IASB) issued an IFRS Practice Statement "Management Commentary" includes a framework for the preparation and presentation of management commentary. The framework provides guidance rather than sets forth

requirements in a standard. The framework identifies five content elements of a “decision-useful management commentary”: (1) the nature of the business; (2) management’s objectives and strategies; (3) the company’s significant resources, risks, and relationships; (4) results of operations; and (5) critical performance measures.

In the United States, the SEC requires listed companies to provide an MD&A and specifies the content.⁸ Management must highlight any favorable or unfavorable trends and identify significant events and uncertainties that affect the company’s liquidity, capital resources, and results of operations. The MD&A must also provide information about the effects of inflation, changing prices, or other material events and uncertainties that may cause the future operating results and financial condition to materially depart from the current reported financial information. In addition, the MD&A must provide information about off-balance-sheet obligations and about contractual commitments, such as purchase obligations. Management should also discuss the critical accounting policies that require them to make subjective judgments and that have a significant impact on reported financial results.

The management commentary, or MD&A, is a good starting place for understanding information in the financial statements. In particular, the forward-looking disclosures, such as those about planned capital expenditures, new store openings, or divestitures, can be useful in projecting a company’s future performance. However, the commentary is only one input for the analyst seeking an objective and independent perspective on a company’s performance and prospects.

Sea Ltd.’s 2021 annual report on Form 20-F includes much information of potential interest to an analyst. The lengthy report contains sections such as “Information on the Company” and “Operating and Financial Review and Prospects” that discuss the company’s history, business model, strategies, key performance indicators, risk factors, relevant laws and regulations, recent financial performance and position, cash flows and working capital, capital expenditures, and key accounting policies.

Auditor's Reports

Financial statements presented in companies’ annual reports are generally required to be audited by an independent accounting firm in accordance with specified auditing standards. The independent auditor then provides a written opinion on the financial statements. This opinion is referred to as the audit report. Audit reports may vary in different jurisdictions, but the minimum components, including a specific statement of the auditor’s opinion, are similar. Audits of financial statements may be required by contractual arrangement, law, or regulation.

International standards on auditing (ISAs) have been developed by the International Auditing and Assurance Standards Board (IAASB). This body has emerged from the International Federation of Accountants. ISAs have been adopted by many countries and are referenced in audit reports issued in those countries. Other countries, such as the United States, specify their own auditing standards. With the enactment of the Sarbanes–Oxley Act of 2002 in the United States, auditing standards for public companies are promulgated by the PCAOB.

⁸ Relevant sections of SEC requirements are included for reference in the FASB Accounting Standards Codification (ASC). The FASB ASC does not include sections of SEC requirements that deal with matters outside the basic financial statements, such as the MD&A.

Under ISAs, the overall objectives of an auditor in conducting an audit of financial statements are

- to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, thereby enabling the auditor to express an opinion on whether the financial statements are prepared, in all material respects, in accordance with an applicable financial reporting framework; and
- to report on the financial statements, and communicate as required by the ISAs, in accordance with the auditor's findings.⁹

Publicly traded companies may also have requirements set by regulators or stock exchanges, such as appointing an independent audit committee within its board of directors to oversee the audit process. The audit process provides a basis for the independent auditor to express an opinion on whether the information in the audited financial statements presents fairly the financial position, performance, and cash flows of the company in accordance with a specified set of accounting standards.

Audits are designed and conducted using sampling techniques, and financial statement line items may be based on estimates and assumptions. This means that the auditors cannot express an opinion that provides absolute assurance about the accuracy or precision of the financial statements. Instead, the independent audit report provides *reasonable assurance* that the financial statements are *fairly presented*, meaning that there is a high probability that the audited financial statements are free from *material* error, fraud, or illegal acts that have a direct effect on the financial statements.

The independent audit report expresses the auditor's opinion on the fairness of the audited financial statements, and specifies which financial statements were audited, the reporting entity, and the date. An *unqualified* audit opinion states that the financial statements give a "true and fair view" (international) or are "fairly presented" (international and United States) in accordance with applicable accounting standards. This is also referred to as an "unmodified" or a "clean" opinion and is the one that analysts would like to see in a financial report. There are several other types of modified opinions. A *qualified* audit opinion is one in which there is some scope limitation or exception to accounting standards. Exceptions are described in the audit report with additional explanatory paragraphs so that the analyst can determine the importance of the exception. An *adverse* audit opinion is issued when an auditor determines that the financial statements materially depart from accounting standards and are not fairly presented. Finally, a *disclaimer of opinion* occurs when, for some reason, such as a scope limitation, the auditors are unable to issue an opinion.

The audit report also describes the basis for the auditor's opinion and, for listed companies, includes a discussion of Key Audit Matters (international) and Critical Audit Matters (United States).¹⁰ Key Audit Matters are defined as issues that the auditor considers to be most important, such as those that have a higher risk of misstatement, involve significant management judgment, or report the effects of significant transactions during the period. Critical Audit Matters are defined as issues that involve "especially challenging, subjective, or complex auditor judgment" and similarly include areas with higher risk of misstatement or that involve significant management judgment and estimates. However, Key and Critical Audit Matters are not necessarily the most important factors for analysts and investors.

⁹ See the International Auditing and Assurance Standards Board (IAASB), *Handbook of International Quality Control, Auditing, Review, Other Assurance, and Related Services Pronouncements* (New York: International Federation of Accountants, 2020).

¹⁰ Discussion of Key Audit Matters in the auditor's report is required by the International Standard on Auditing (ISA) ISA 701, effective in 2017, issued by the International Audit and Assurance Standards Board. Discussion of Critical Audit Matters in the auditor's report is required by the Auditor Reporting Standard AS 3101, effective for large filers' fiscal years ending on or after 30 June 2019, issued by the PCAOB.

Exhibit 5 presents excerpts from the independent auditor's report contained in Sea Ltd.'s 2021 annual report. Note that Sea Ltd. received an unqualified audit opinion (i.e., clean or unmodified opinion) from Ernst & Young LLP for the company's fiscal year ended 31 December 2021.

Exhibit 5: Excerpts from Sea Ltd.'s 2021 Independent Audit Report

To the Shareholders and the Board of Directors of Sea Limited

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Sea Limited (the Company) as of December 31, 2021 and 2020, the related consolidated statements of operations, comprehensive loss, cash flows, and shareholders' equity (deficit) for each of the three years in the period ended December 31, 2021, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework), and our report dated April 22, 2022 expressed an unqualified opinion thereon.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB. We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated

financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Recognition of Digital Entertainment (“DE”) Revenue

Description of the Matter:

For the year ended December 31, 2021, the Company’s revenue arising from DE was \$4,320.0 million.

As outlined in Note 2(o) of the consolidated financial statements, DE revenue is recognized over the performance obligation period. The Company has determined that an implied obligation exists to the paying users to continue providing hosting services and access to the purchased virtual goods within the online games over an estimated service period. Such service period is largely determined in accordance with the estimated average lifespan of the paying users of the said games or similar games.

Auditing the DE revenue recognition process was complex and involved judgement to determine the historical paying users’ inactive rate and playing behavior, in estimating the average lifespan of the paying users of the said games or similar games. In addition, the Company utilized various operating systems to process user data and transactions and relied on automated processes and controls over the completeness and accuracy of the historical user and game data, which were key inputs to the above-mentioned estimates.

How We Addressed the Matter in Our Audit:

We obtained an understanding, evaluated the design and tested the operating effectiveness of internal controls over the Company’s DE revenue recognition process. For example, we tested the automated controls of the related operating systems. We also tested the effectiveness of management’s review controls over assessing the completeness and accuracy of the historical user and game data and the appropriateness of the judgements regarding the most relevant historical user and game data to be applied in their estimates.

To test the recognition of DE revenue, our audit procedures included, among others, testing the completeness and accuracy of the above-mentioned underlying historical user and game data and assessing the reasonableness of the historical data applied in estimating the average lifespan of the paying users of the said games or similar games. We also recalculated the amount of revenue to be deferred based on management’s estimated service periods and compared those amounts with the amounts recorded by the Company.

Measurement of long-lived assets in E-commerce (“EC”) segment

Description of the Matter:

As at December 31, 2021, the Company’s long-lived assets in EC segment amounted to approximately 75.7% of the Company’s long-lived assets. The long-lived assets include property and equipment, operating lease right-of-use assets and intangible assets.

As outlined in Note 2(m) to the consolidated financial statements, the Company evaluates its long-lived assets for impairment when there are events or changes in circumstances which indicate that the carrying amounts of the long-lived assets may not be recoverable. Due to the continued losses incurred by EC segment, the Company evaluated the related long-lived assets for impairment at the asset group level by comparing the carrying amount of the asset group to the recoverable value determined by forecasted undiscounted cash flows expected to be generated by this asset group.

Auditing management's long-lived assets impairment test was highly judgmental due to the magnitude of the carrying amount of long-lived assets and management's judgement in estimating the recoverable value (undiscounted cash flows) of the asset group, which were sensitive to key assumptions such as projected revenue and sales and marketing expenses.

How We Addressed the Matter in Our Audit:

We obtained an understanding, evaluated the design and tested the operating effectiveness of controls over the Company's long-lived asset impairment process to determine the recoverable value of the asset group. For example, we tested controls over management's review of the key assumptions used in estimating the recoverable value.

To test the impairment of long-lived assets, our audit procedures included, among others, obtaining an understanding from management regarding the basis of which the undiscounted cash flows were prepared and assessing the reasonableness of the forecasted undiscounted cash flows by comparing them against the Company's business strategies and underlying key assumptions over the forecast periods, taking into consideration current industry and economic trends. We performed sensitivity analyses over the key assumptions described above to evaluate the changes to the estimated recoverable value for the asset group that would result from changes in the assumptions.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2010.

Singapore

April 22, 2022

Source: Sea Ltd., 2021 Annual Report.

In the United States, under the Sarbanes–Oxley Act, the auditors must also express an opinion on the company's internal control systems. This information may be provided in a separate opinion or incorporated as a paragraph in the opinion related to the financial statements. Internal controls are the company's processes, personnel, and systems designed to ensure that the company's process for generating financial reports is sound. Although management has always been responsible for maintaining effective internal control, the Sarbanes–Oxley Act greatly increases management's responsibility for demonstrating that the company's internal controls are effective. Management of publicly traded companies in the United States are now required by securities regulators to explicitly accept responsibility for the effectiveness of internal control, evaluate the effectiveness of internal control using suitable control criteria, support the evaluation with sufficient competent evidence, and provide a report on internal control.

Although these reports and attestations provide some assurances to analysts, they are not infallible. The analyst must always use a degree of healthy skepticism when analyzing financial statements.

COMPARISON OF IFRS WITH ALTERNATIVE FINANCIAL REPORTING SYSTEMS

5

- ☐ describe implications for financial analysis of alternative financial reporting systems and the importance of monitoring developments in financial reporting standards

The adoption of IFRS as the required financial reporting standard by most countries outside the United States has advanced the goal of global convergence. Nevertheless, there are still significant differences in financial reporting in the global capital markets. Arguably, the most critical are the differences that exist between IFRS and US GAAP as a significant number of the world's listed companies use one of these two reporting standards.

In general, the IASB and FASB work together to coordinate changes to accounting standards and reduce differences between the standards. While convergence of conceptual frameworks and existing standards was put on hold in the late 2000s, new accounting standards have been mostly or entirely converged, resulting in increasing uniformity over time as major new standards have been adopted (e.g., revenue recognition, leasing, credit losses). Maintaining convergence on new standards remains a priority of both standard-setting bodies. Later modules provide a more detailed review of related differences in IFRS and US GAAP, though some major differences are outlined in Exhibit 6.

Exhibit 6: Selected Major Differences between IFRS and US GAAP

Basis for Comparison	US GAAP	IFRS
Developed by	Financial Accounting Standards Board (FASB)	International Accounting Standards Board (IASB)
Based on	Rules	Principles
Interest paid	Cash Flows from Operating Activities	Cash Flows from Financing Activities <i>or</i> Cash Flows from Operating Activities
Inventory valuation	First in, First out (FIFO); Last in, First out (LIFO); and Weighted Average Method	FIFO and Weighted Average Method
Development cost	Treated as an expense	Capitalized, only if certain conditions are satisfied
Reversal of Inventory Write-down	Prohibited	Permissible, if specified conditions are met

Because reconciliation disclosures between IFRS and US GAAP are not required, an analyst comparing two companies that use different reporting standards must be aware of areas in which accounting standards have not converged. In many cases, a user of financial statements prepared under different accounting standards does not have enough information to make the specific adjustments required to achieve comparability. Instead, an analyst must maintain caution in interpreting comparative

financial measures produced under different accounting standards and monitor significant developments in financial reporting standards, as this can have important implications for comparing the performance of companies and security valuation.

Monitoring Developments in Financial Reporting Standards

Analysts need to monitor ongoing developments in financial reporting and assess their implications for security analysis and valuation. The need to monitor developments in financial reporting standards does not mean that analysts should be accountants. An accountant monitors these developments from a preparer's perspective; an analyst needs to monitor them from a user's perspective. More specifically, analysts need to know how these developments will affect financial reports.

Analysts can remain aware of developments in financial reporting standards by monitoring new products or transactions, actions of standard setters and other groups representing users of financial statements (such as CFA Institute), and company disclosures regarding critical accounting policies and estimates.

New Products or Types of Transactions

New products and new types of transactions can have unusual or unique elements to them such that no explicit guidance in the financial reporting standards exists. New products or transactions typically arise from economic events, such as new businesses (e.g., fintech), or from a newly developed financial instrument or financial structure (e.g., cryptocurrencies and other digital assets). Financial instruments, whether exchange traded or not, are typically designed to enhance a company's business or to mitigate inherent risks. At times, however, financial instruments or structured transactions have been developed primarily for purposes of financial report "window dressing."

Although companies might discuss new products and transactions in their financial reports, the analyst can also monitor business journals and the capital markets to identify such items. Additionally, when one company in an industry develops a new product or transaction, other companies in the industry often do the same. Once new products, financial instruments, or structured transactions are identified, it is helpful to gain an understanding of the business purpose. If necessary, an analyst can obtain further information from a company's management, which should be able to describe the economic purpose, the financial statement reporting, significant estimates, judgments applied in determining the reporting, and future cash flow implications for these items.

Evolving Standards and the Role of CFA Institute

The actions of standard setters and regulators are unlikely to be helpful in identifying new products and transactions, given the lag between new product development and regulatory action. Monitoring the actions of these authorities is nonetheless important for another reason: Changes in regulations can affect companies' financial reports and, thus, valuations. This is particularly true if the financial reporting standards change to require more explicit identification of matters affecting asset/liability valuation or financial performance. For example, one regulatory change required companies to include a provision for expenses associated with the grant and vesting of employee stock option grants as an expense in the income statement. Prior to the required expensing, an analyst could assess the dilutive effect to shareholders associated with stock option grants only by reviewing information disclosed in the notes to the financial statements.

To the extent that some market participants do not examine financial statement details and thus ignore some items when valuing a company's securities, more explicit identification could affect the value of the company's securities. Additionally, it is

plausible to believe that management is more attentive to and rigorous in any calculations/estimates of items that appear in the financial statements, compared with items that are disclosed only in the notes.

The IASB (www.iasb.org) and FASB (www.fasb.org) provide a great deal of information on their websites regarding new standards and proposals for future changes in standards. In addition, the IASB and FASB seek input from the financial analyst community—those who regularly use financial statements in making investment and credit decisions. When a new standard is proposed, an exposure draft is made available and users of financial statements can draft comment letters and position papers for submission to the IASB and FASB to evaluate the proposal.

CFA Institute is active in supporting improvements to financial reporting. Volunteer members of CFA Institute serve on several liaison committees that meet regularly to make recommendations to the IASB and FASB on proposed standards and to draft comment letters and position papers. The comment letters and position papers of these groups on financial reporting issues are available at www.cfainstitute.org/advocacy.

In 2007, CFA Institute issued a position paper titled *A Comprehensive Business Reporting Model: Financial Reporting for Investors*, which provides a suggested model for significantly improving financial reporting. The position paper remains relevant in stating:

Corporate financial statements and their related disclosures are fundamental to sound investment decision making. The well-being of the world's financial markets, and of the millions of investors who entrust their financial present and future to those markets, depends directly on the information financial statements and disclosures provide. Consequently, the quality of the information drives global financial markets. The quality, in turn, depends directly on the principles and standards managers apply when recognizing and measuring the economic activities and events affecting their companies' operations. ...

Investors require timeliness, transparency, comparability, and consistency in financial reporting. Investors have a preference for decision relevance over reliability ... "analysts need to know economic reality—what is really going on—to the greatest extent it can be depicted by accounting numbers." Corporate financial statements that fail to reflect this economic reality undermine the investment decision-making process.¹¹

Among other principles, the proposed model stresses the importance of information regarding the current fair value of assets and liabilities, of neutrality in financial reporting, and of providing detailed information on cash flows to investors through the choice of the so-called direct format for the cash flow statement.

In summary, analysts can improve their investment decision making by keeping current on financial reporting standards. In addition, analysts can contribute to improving financial reporting by sharing their perspective as users with standard-setting bodies, which typically invite comments concerning proposed changes.

¹¹ *A Comprehensive Business Reporting Model: Financial Reporting for Investors* (Charlottesville, VA: CFA Institute Centre for Financial Market Integrity, July 2007), p. 1, 2.

6

OTHER SOURCES OF INFORMATION



describe information sources that analysts use in financial statement analysis besides annual and interim financial reports

In addition to regulated information from issuers such as the financial statements and notes in filings, analysts use a variety of other information sources for financial analysis, which we group by origin: issuers, public third-party, proprietary third-party, and proprietary primary research.

- Issuer sources (other than regulatory filings such as annual and quarterly reports and proxy statements)
 - Earnings calls. Earnings calls are webcast or teleconferenced presentations and question-and-answer sessions hosted by issuers' management to discuss financial results. The primary audience for the calls are analysts, investors, and members of the media. While not legally required, most public companies conduct these calls to provide complementary information to their regulatory filings, such as explaining differences in performances from expectations, revisions to forward-looking targets, and explaining corporate actions such as acquisitions and restructurings. Analysts ask probing questions to gain further color from management to understand past results and actions to sharpen their estimates. Platforms such as Bloomberg, Wind, and FactSet transcribe earnings calls and other presentations.
 - Presentations and events, such as investor days. Similar to earnings calls but scheduled on an ad hoc basis, issuers and investment banks sometimes host events during which management teams give in-depth presentations on their business or specific topics and business segments. Like earnings calls, analysts must be aware that management is biased to their perspective, and often need to ask questions for the information they want.
 - Press releases. Press releases are announcements and statements of information (typically in writing but can be videos or graphics) by companies and their management. Common topics include notifications of upcoming events, product releases and changes, management and board of director changes, and M&A or restructuring announcements. Press releases are often distributed not only on issuers' websites but also on third-party news sources.
 - Speaking with management, investor relations, or other company personnel.
 - Company website or properties that the analyst may be able to visit as a customer or an investor. It is often useful to experience an issuer's and competitors' products firsthand, though it is not always possible (e.g., pharmaceuticals).
- Public third-party sources
 - Free industry whitepapers or analyst reports from a consultancy, usually accessed through internet search engines.

- Economic or industry indicators from governments and other organizations, such as retail sales and price indexes, often released monthly or quarterly.
- General news outlets.
- Industry-specific news outlets.
- Social media, which may be a useful gauge of customer sentiment for a company's products.
- Proprietary third-party sources
 - Analyst reports and communications, including from the sell side or analysts and credit rating agencies.
 - Reports and data from platforms such as Bloomberg, Wind, and FactSet.
 - Reports and data from consultancies, often industry-specific sources, such as Rystad in energy, iQvia and Evaluate in biopharma, and Gartner and IDC in information technology industries.
- Proprietary primary research
 - Surveys, conversations, product comparisons, and other studies commissioned by the analyst or conducted directly.

Information on the economy, industry, and peer companies is useful in putting the company's financial performance and position in perspective and in assessing the company's future. In most cases, information from sources apart from the company is crucial to an analyst's effectiveness. For example, an analyst studying a consumer-oriented company will typically seek direct experience with the products (taste the food or drink, use the shampoo or soap, visit the stores or hotels). An analyst following a highly regulated industry will study the existing and expected relevant regulations. An analyst following a highly technical industry will gain relevant expertise personally or seek input from a technical specialist.

PRACTICE PROBLEMS

1. Ratios are an input into which step in the financial statement analysis framework?
 - A. Process data
 - B. Collect input data
 - C. Analyze/interpret the processed data
2. Which phase in the financial statement analysis framework is *most likely* to involve producing updated reports and recommendations?
 - A. Follow-up
 - B. Analyze/interpret the processed data
 - C. Develop and communicate conclusions and recommendations
3. Which of the following *best* describes the role of financial statement analysis?
 - A. To provide information about a company's performance
 - B. To provide information about a company's changes in financial position
 - C. To form expectations about a company's future performance and financial position
4. The primary role of financial statement analysis is *best* described as:
 - A. providing information useful for making investment decisions.
 - B. evaluating a company for the purpose of making economic decisions.
 - C. using financial reports prepared by analysts to make economic decisions.
5. International Financial Reporting Standards are currently developed by which entity?
 - A. IFRS Foundation
 - B. International Accounting Standards Board
 - C. International Organization of Securities Commissions
6. US GAAP are currently developed by which entity?
 - A. Securities and Exchange Commission
 - B. Financial Accounting Standards Board
 - C. Public Company Accounting Oversight Board
7. A core objective of the International Organization of Securities Commissions is to:
 - A. eliminate systemic risk.
 - B. protect users of financial statements.

- C. ensure that markets are fair, efficient, and transparent.
8. Which of the following *best* describes why the notes that accompany the financial statements are required? The notes:
- A. permit flexibility in statement preparation.
 - B. standardize financial reporting across companies.
 - C. provide information necessary to understand the financial statements.
9. Accounting policies, methods, and estimates used in preparing financial statements are *most likely* to be found in the:
- A. auditor's report.
 - B. management commentary.
 - C. notes to the financial statements.
10. Information about management and director compensation is *most likely* to be found in the:
- A. auditor's report.
 - B. proxy statement.
 - C. earnings release.
11. Information about a company's objectives, strategies, and significant risks are *most likely* to be found in the:
- A. auditor's report.
 - B. management commentary.
 - C. notes to the financial statements.
12. What type of audit opinion is preferred when analyzing financial statements?
- A. Adverse
 - B. Qualified
 - C. Unqualified
13. An auditor determines that a company's financial statements are prepared in accordance with applicable accounting standards except with respect to inventory reporting. This exception is *most likely* to result in an audit opinion that is:
- A. adverse.
 - B. qualified.
 - C. unqualified.
14. An independent audit report is *most likely* to provide:
- A. absolute assurance about the accuracy of the financial statements.
 - B. reasonable assurance that the financial statements are fairly presented.

- C. a qualified opinion with respect to the transparency of the financial statements.
15. Interim financial reports released by a company are *most likely* to be:
- A. monthly.
 - B. unaudited.
 - C. unqualified.
16. Which of the following sources of information used by analysts is found outside a company's annual report?
- A. Auditor's report
 - B. Peer company analysis
 - C. Management discussion and analysis

SOLUTIONS

1. C is correct. Ratios are an output of the process information step but are an input into the analyze/interpret data step.
2. A is correct. The follow-up phase involves gathering information and repeating the analysis to determine whether it is necessary to update reports and recommendations.
3. C is correct. In general, analysts seek to examine the past and current performance and financial position of a company to form expectations about its future performance and financial position.
4. B is correct. The primary role of financial statement analysis is to use financial reports prepared by companies to evaluate their past, current, and potential performance and financial position for the purpose of making investment, credit, and other economic decisions.
5. B is correct. The International Accounting Standards Board (IASB) is currently charged with developing International Financial Reporting Standards.
6. B is correct. US Generally Accepted Accounting Principles are developed by the US Financial Accounting Standards Board (FASB).
7. C is correct. A core objective of IOSCO is to ensure that markets are fair, efficient, and transparent. The other core objectives are to reduce, not eliminate, systemic risk and to protect investors, not all users of financial statements.
8. C is correct. The notes provide information that is essential to understanding the information provided in the primary statements.
9. C is correct. The notes disclose choices in accounting policies, methods, and estimates.
10. B is correct. Disclosure of management compensation is typically included in the proxy statement. An earnings release is about corporate earnings, not what managers earn as compensation.
11. B is correct. These are components of management commentary.
12. C is correct. An unqualified opinion is a “clean” opinion and indicates that the financial statements present the company’s performance and financial position fairly in accordance with applicable accounting standards.
13. B is correct. A qualified audit opinion is one in which there is some scope limitation or exception to accounting standards. Exceptions are described in the audit report with additional explanatory paragraphs so that the analyst can determine the importance of the exception.
14. B is correct. The independent audit report provides reasonable assurance that the financial statements are fairly presented, meaning that there is a high probability that the audited financial statements are free from material error, fraud, or illegal acts that have a direct effect on the financial statements.
15. B is correct. Interim reports are typically provided semiannually or quarterly and require certain financial information, including unaudited financial statements

and an MD&A for the interim period covered by the report. Unqualified refers to a type of audit opinion.

16. B is correct. When performing financial statement analysis, analysts should review all company sources of information as well as information from external sources regarding the economy, the industry, the company, and peer (comparable) companies.

LEARNING MODULE

2

Analyzing Income Statements

by Elaine Henry, PhD, CFA, and Thomas R. Robinson, PhD, CAIA, CFA.

Elaine Henry, PhD, CFA, is at Stevens Institute of Technology (USA). Thomas R. Robinson, PhD, CAIA, CFA, is at AACSB International (USA).

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe general principles of revenue recognition, specific revenue recognition applications, and implications of revenue recognition choices for financial analysis
☐	describe general principles of expense recognition, specific expense recognition applications, implications of expense recognition choices for financial analysis and contrast costs that are capitalized versus those that are expensed in the period in which they are incurred
☐	describe the financial reporting treatment and analysis of non-recurring items (including discontinued operations, unusual or infrequent items) and changes in accounting policies
☐	describe how earnings per share is calculated and calculate and interpret a company's basic and diluted earnings per share for companies with simple and complex capital structures including those with antidilutive securities
☐	evaluate a company's financial performance using common-size income statements and financial ratios based on the income statement

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

1

INTRODUCTION

Income statements and analytical measures derived from them, such as sales growth, operating margin, and earnings per share (EPS), are critical for equity and credit analysis. Investors analyze income statements to evaluate companies' growth, profitability, and risks, and often use income statement figures in valuation. Corporate financial announcements frequently emphasize information reported in income statements, particularly earnings, more than information reported in the other financial statements.

LEARNING MODULE OVERVIEW



- Revenue is recognized in the period it is earned, which may or may not be in the same period as the related cash collection.
- An analyst should identify differences in companies' revenue recognition methods and adjust reported revenue where possible to facilitate comparability. In cases in which the available information does not permit adjustment, an analyst can characterize the revenue recognition as more or less conservative and thus qualitatively assess how differences in policies might affect financial ratios and judgments about profitability.
- As of the beginning of 2018, revenue recognition standards have converged across US GAAP and International Financial Reporting Standards (IFRS). The core principle of the converged standards is that revenue should be recognized to "depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in an exchange for those goods or services."
- To achieve the core principle, the standard describes the application of five steps in recognizing revenue. The standard also specifies the treatment of some related contract costs and disclosure requirements.
- The general principles of expense recognition include a process to match expenses to revenue (e.g., cost of goods sold), to the period in which the expenditure occurs (e.g., administrative costs), or to the period of expected benefits of the expenditures (e.g., depreciation and amortization).
- In expense recognition, choice of method (i.e., depreciation method and inventory cost method), as well as estimates (i.e., uncollectible accounts, warranty expenses, assets' useful life, and salvage value) affect a company's reported income. An analyst should identify differences in companies' expense recognition methods and adjust reported financial statements where possible to facilitate comparability. In cases in which the available information does not permit adjustment, an analyst can characterize the policies and estimates as more or less conservative and thus qualitatively assess how differences in policies might affect financial ratios and judgments about companies' performance.
- To assess a company's future earnings, it is helpful to separate those prior years' items of income and expense that are likely to continue in the future from those items that are less likely to continue.

- Under IFRS, a company should present additional line items, headings, and subtotals beyond those specified when such presentation is relevant to an understanding of the entity's financial performance. Some items from prior years clearly are not expected to continue in future periods and are separately disclosed on a company's income statement. Under US GAAP, unusual or infrequently occurring items, which are material, are presented separately within income from continuing operations.
- Non-operating items are reported separately from operating items on the income statement. Under both IFRS and US GAAP, the income statement reports separately the effect of the disposal of a component operation as a "discontinued" operation, net of income taxes.
- Basic EPS is the amount of income available to common shareholders divided by the weighted average number of common shares outstanding over a period. The amount of income available to common shareholders is the amount of net income remaining after preferred dividends (if any) have been paid.
- If a company has a simple capital structure (i.e., one with no potentially dilutive securities), then its basic EPS is equal to its diluted EPS. If, however, a company has dilutive securities, its diluted EPS is no greater than its basic EPS.
- Diluted EPS is calculated using the if-converted method for convertible securities and the treasury stock method for options.
- Common-size analysis of the income statement involves stating each line item on the income statement as a percentage of sales. Common-size statements facilitate comparison across time periods and across companies of different sizes.

REVENUE RECOGNITION

2



describe general principles of revenue recognition, specific revenue recognition applications, and implications of revenue recognition choices for financial analysis

General Principles

A fundamental principle of accrual accounting is that revenue is recognized (reported on the income statement) when it is earned, so the company's financial records reflect revenue from the sale when the risk and reward of ownership is transferred; this is often when the company delivers the goods or services. If the delivery was on credit, a related asset, such as trade or accounts receivable, is created. Later, when cash changes hands, the company's financial records simply reflect that cash has been received to settle an account receivable. Similarly, in some situations, a company receives cash in advance and but delivers the product or service later, perhaps over a period of time. In this case, the company would record a liability for **unearned revenue**, or deferred

revenue, when the cash is initially received, and revenue would be recognized over time as products and services are delivered. An example would be a subscription payment received in advance for cloud-based software delivered over a year.

Accounting Standards for Revenue Recognition

The converged accounting standards issued by the IASB and FASB in May 2014 introduced some changes to the basic principles of revenue recognition. The content of the two standards is nearly identical, and this discussion pertains to both, unless specified otherwise. The converged standard aims to provide a principles-based approach to revenue recognition that can be applied to many types of revenue-generating activities.

The core principle of the converged standard is that revenue should be recognized to “depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in an exchange for those goods or services.” To achieve the core principle, the standard describes the application of the following five steps in recognizing revenue:

1. identify the contract(s) with a customer,
2. identify the separate or distinct performance obligations in the contract,
3. determine the transaction price,
4. allocate the transaction price to the performance obligations in the contract, and
5. recognize revenue when (or as) the entity satisfies a performance obligation.

According to the standard, a contract is an agreement and commitment with commercial substance between the contacting parties. It establishes each party’s *obligations* and *rights*, including payment terms. In addition, a contract exists only if collectability is probable. Each standard uses the same wording, but the threshold for probable collectability differs. Under IFRS, probable means more likely than not, and under US GAAP, it means likely to occur. As a result, economically similar contracts may be treated differently under IFRS and US GAAP.

The performance obligations within a contract represent promises to transfer distinct good(s) or service(s). A good or service is distinct if the customer can benefit from it on its own or in combination with readily available resources and if the promise to transfer it can be separated from other promises in the contract. Each identified performance obligation is accounted for separately.

The transaction price is what the seller estimates will be received in exchange for transferring the good(s) or service(s) identified in the contract. The transaction price is then allocated to each identified performance obligation. Revenue is recognized when a performance obligation is fulfilled. Steps three and four address amounts, and step five addresses timing of recognition. The amounts recognized reflect expectations about collectability and (if applicable) an allocation to multiple obligations within the same contract.

Revenue should be recognized only when it is highly probable that it will not be subsequently reversed. If it is likely to be reversed, the seller will record a minimal amount of revenue upon sale and recognize a refund liability and “right to returned goods” asset on the balance sheet based on the carrying amount of inventory less costs of recovery.

The entity will recognize revenue when it is able to satisfy the performance obligation by transferring control of the good or service to the customer. Factors to consider when assessing whether the customer has obtained control of include the following:

- entity has a present right to payment,
- customer has legal title,

- customer has physical possession,
- customer has the significant risks and rewards of ownership, and
- customer has accepted the good or service.

For a simple contract with only one deliverable at a single point in time, completing these five steps is straight-forward. For more complex contracts—such as when the performance obligations are satisfied over time, when the terms of the multiperiod contracts change, or when the performance obligation includes various components of goods and services—accounting choices are less obvious. The steps in the standards are intended to provide guidance that can be generalized to most situations.

If the performance obligation is satisfied at the end of these five steps, and there is no contingency regarding payment, then revenue and accounts receivable are recognized. In cases in which revenue is recognized but the payment by the customer is conditional on some other future performance, a contract asset is initially presented on the balance sheet, until performance obligations are met, and a receivable can be recognized. If consideration is received in advance of transferring good(s) or service(s), the seller records a contract liability.

As an analyst, you will encounter many companies with complex revenue recognition policies, reflecting the diversity of business models in practice. Several examples adapted from real companies are discussed in Example 1.

EXAMPLE 1

Applying the Converged Revenue Recognition Standards

Principal Versus Agent

MegaDigital is an online marketplace that sells goods and delivers them quickly to customers. For some sales, MegaDigital acts as a principal in which it controls the product before the goods are transferred to the customer. In other sales, MegaDigital acts as an agent in which it arranges for the transfer of a product controlled by a third-party seller. In transactions in which MegaDigital is the principal, revenue is recorded as the total amount of considerations received for the transfer of the product. In transactions in which MegaDigital is the agent, it records revenue only for the portion of the considerations, which amounts to its fee or commission. This can have a significant impact on common size and ratio analysis. Revenue is lower but profit margins are higher for sales for which MegaDigital is an agent.

Assume MegaDigital sells a particular product as a principal for USD100 that it purchased for USD70. Additionally, there are USD10 of other selling, general, and administrative costs. The margins would be:

Sales	USD100	100 percent
Cost of Sales	70	70 percent
Gross Profit	30	30 percent
SG&A	10	10 percent
Net Profit	20	20 percent

If MegaDigital acts an agent for the same item with the same retail price, MegaDigital would receive a commission of USD30 and still incurs USD10 of other costs. Margins would be:

Sales	USD30	100 percent
Cost of Sales	0	0 percent
Gross Profit	30	100 percent
SG&A	10	33 percent
Net Profit	20	67 percent

For companies selling both as a principal and agent, such as many e-commerce companies, an analyst would need to evaluate the relative proportion of principal versus agent sales to evaluate and forecast overall margins. This is especially important if the mix of principal and agent sales is expected to change.

Franchising/Licensing

Mahjong Pizza both operates and franchises pizza delivery restaurants around the world. Revenue recognition standards require that the company disaggregate revenue from contracts with customers into categories that depict how the nature, amount, timing, and uncertainty of revenue and cash flows are affected by economic factors. Companies must present revenues disaggregated in consolidated statements of income to satisfy this requirement. Mahjong Pizza presents the following disaggregated revenue items:

- company-owned stores revenues,
- franchise royalties and fees, and
- supply chain revenues.

Company-owned stores revenues are of retail sales of food at stores that Mahjong owns and operates.

Franchise royalties and fees are comprised of fees from third-party franchisees that are licensed to operate Mahjong restaurants. Each franchisee is generally required to pay fees equal to 5.5 percent of restaurant sales. The company recognizes the royalty fee as revenue, not the total sales of the franchisees' restaurants. Upfront fees for opening new units are initially recognized as deferred revenue and subsequently amortized to revenue on a straight-line basis over the term of each respective franchise agreement, typically 10 years.

Supply chain revenues are primarily composed of sales of food, equipment, and supplies to franchisees. Revenues are recognized upon delivery or shipment of the related products to franchisees, based on shipping terms.

Software as a Service or License

CReaM Software and Services is a technology company providing customer relationship management software and services to business, government and not-for-profit organizations. Organizations may purchase a software license and install it on their own systems. Alternatively, they may subscribe to CReaM's cloud services platform through which they can access CReaM's software over the internet for a monthly subscription fee.

Under IFRS 15, if a company provides a license to use software where the company will take possession of the software for installation on their own system, the company will report revenue either over the term of the license or at the time of the transfer of the license. Companies should report the revenue from the license over the term of the license, if under the contract or the company's normal business activities:

- the software provider will continue to undertake activities that significantly affect the software (e.g., upgrades/enhancements),

- the rights expose the customer to positive or negative impacts from those activities, and
- the activities do not result in a transfer of goods or services.

If these criteria are not met, then the revenue is recognized when the license is transferred to the customer. CReaM's annual report footnotes state:

Software revenues include revenues associated with term and perpetual software licenses that provide the customer with a right to use the software as it exists when made available. Revenues from term and perpetual software licenses are generally recognized at the point in time when the software is made available to the customer. Revenue from software support and updates is recognized as the support and updates are provided, which is generally ratably over the contract term.

Under the terms of CReaM's license, the software is sold "as is" and revenue is recognized at the time of the license transfer. CReaM, however, also provides a support contract for updates for which revenue is recognized over the contract term.

CReaM's cloud clients have access to constantly updated software. CReaM reports:

Cloud services allow customers to use the Company's software without taking possession of the software. Revenue is generally recognized over the contract term. Substantially all of the Company's subscription service arrangements are non-cancelable and do not contain refund-type provisions.

In the case of CReaM, an analyst must understand the composition of revenue between licensed software in which case revenue is recognized upfront versus software as a service in which case revenue is recognized over time.

Long-Term Contracts

Armored Vehicles Inc. (AVI) manufactures weapons systems and vehicles for military customers. The company enters long-term contracts that generally extend over several years. Performance on the contracts is satisfied over time. Under IFRS 15, a performance obligation is satisfied over time if one of the following criteria is met:

- The customer simultaneously receives and consumes the benefits provided by the entity's performance as the entity performs (e.g., routine service contracts).
- The entity's performance creates or enhances an asset that the customer controls as the asset is created or enhanced (e.g., refurbishment of a factory owned and controlled by the customer or building a road for a governmental agency).
- The entity's performance does not create an asset with alternative use to the entity and the entity has an enforceable right to payment for performance completed to date (e.g., construction of a large unique asset that may not be able to be sold to another customer such as a weapons system).

AVI recognizes long-term contract revenue over the contract term as the work progresses, either as products are produced or as services are rendered because of the continuous transfer of control to the customer. For its military contracts, this continuous transfer of control to the customer is supported by

clauses in the contract that allow the customer to unilaterally terminate the contract for convenience, pay for costs incurred plus a reasonable profit, and take control of any work in process.

Under IFRS 15, the extent of progress towards completion may be measured by output methods (e.g., appraisals or units completed) or input methods (e.g., costs incurred relative to estimated total costs). AVI reports that its accounting for long-term contracts involves a judgmental process of estimating total sales, costs and profit for each performance obligation. Cost of sales is recognized as incurred. The amount reported as revenues is determined by adding a proportionate amount of the estimated profit to the amount reported as cost of sales. Recognizing revenue as costs are incurred provides an objective measure of progress on the long-term contract and thereby best depicts the extent of transfer of control to the customer.

As an example, AVI has a contract to produce a weapons system for a total price of USD10 million. The expected total costs to produce the system is USD7 million and the estimated profit is USD3 million. The system will take two years to produce. In Year 1 of the contract, AVI incurs USD4.2 million of costs representing 60 percent of total estimated costs. AVI would recognize revenue of USD6 million and profit of USD1.8 million in Year 1 (both 60 percent of expected revenue and profits).

If in Year 2, the system is completed with actual total cumulative costs of USD7.5 million, the company would report revenue of USD4 million and costs of USD3.3 million for a Year 2 profit of USD0.7 million and cumulative profit of USD2.5 million.

Bill and Hold Arrangements

In addition to the long-term contracts discussed previously, AVI produces custom armored vehicles that some customers may not be able to take possession of immediately (because, for example, a lack of storage space). IFRS 15 provides that in such a “bill and hold” arrangement AVI can determine when it has satisfied its performance obligation based on when a customer obtains control of the product. Under IFRS 15, this is when all the following criteria are met:

- The reason for the bill and hold arrangement must be substantive (e.g., the customer has requested the arrangement).
- The product must be identified separately as belonging to the customer.
- The product currently must be ready for physical transfer to the customer.
- The entity cannot have the ability to use the product or to direct it to another customer.

In AVI’s case, each vehicle is identified by a unique vehicle identification number and upon completion, title and risk of loss has passed to the customer. AVI recognizes revenue when the product is ready for delivery to the customer but is directed by the customer to hold delivery.

The disclosure requirements under IFRS 15 are quite extensive to provide sufficient information to financial statement users on the nature, amount, and timing of cash flows from customers. Companies are required to disclose revenue from contracts with customers disaggregated into different categories of contracts. The categories might be based on the type of product, the geographic region, the type of customer or sales channel, the type of contract pricing terms, the contract duration, or the timing of transfers. Companies are also required to disclose balances of any contract-related

assets and liabilities and significant changes in those balances, remaining performance obligations and transaction price allocated to those obligations, and any significant judgments and changes in judgments related to revenue recognition. These disclosures are typically provided in a note to the financial statements titled “Revenue” or similar.

EXPENSE RECOGNITION

3

- ☐ describe general principles of expense recognition, specific expense recognition applications, implications of expense recognition choices for financial analysis and contrast costs that are capitalized versus those that are expensed in the period in which they are incurred

Assume a company purchased inventory for cash and sold the entire inventory in the same period. When the company paid for the inventory, absent indications to the contrary, it is clear that inventory cost was incurred and when that inventory is sold, it should be recognized as an expense (cost of goods sold). Assume also that the company paid all operating and administrative expenses in cash within each accounting period. In such a simple hypothetical scenario, no issues of expense recognition would arise. In practice, however, as with revenue recognition, determining when expenses should be recognized can be somewhat more complex.

General Principles

In general, a company recognizes expenses in the period that it consumes (i.e., uses up) the economic benefits associated with the expenditure, or loses some previously recognized economic benefit. The three common expense recognition models are as follows: the matching principle, expensing as incurred, and capitalization with subsequent depreciation or amortization.

Under matching, a company recognizes expenses (e.g., cost of goods sold) when associated revenues are recognized, and thus, expenses and revenues are matched. Associated revenues and expenses are those that result directly and jointly from the same transactions or events. Unlike the simple scenario in which a company purchases inventory and sells all of the inventory within the same accounting period, in practice, it is more likely that some of the current period’s sales are made from inventory purchased in a previous period or previous periods. It is also likely that some of the inventory purchased in the current period will remain unsold at the end of the current period and so will be sold in a following period. Matching requires that a company recognizes cost of goods sold in the same period as revenues from the sale of the goods. Strictly speaking, IFRS do not refer to a “matching principle” but rather to a “matching concept” or to a process resulting in “matching of costs with revenues.”

Example 2 demonstrate matching applied to inventory and cost of goods sold.

EXAMPLE 2

The Matching of Inventory Costs with Revenues

Kahn Distribution Limited (KDL), a hypothetical company, purchases inventory items for resale. At the beginning of 20X1, Kahn had no inventory on hand. During 20X1, KDL had the following transactions:

Inventory Purchases

First quarter	2,000	units at USD40 per unit
Second quarter	1,500	units at USD41 per unit
Third quarter	2,200	units at USD43 per unit
Fourth quarter	1,900	units at USD45 per unit
Total	7,600	units at a total cost of USD321,600

KDL sold 5,600 units of inventory during the year at USD50 per unit and received cash. KDL determines that there were 2,000 remaining units of inventory and specifically identifies that 1,900 were those purchased in the fourth quarter and 100 were purchased in the third quarter.

1. What are the revenue and expense associated with these transactions during 20X1 based on specific identification of inventory items as sold or remaining in inventory? (Assume that the company does not expect any products to be returned.)

Solution:

The revenue for 20X1 would be USD280,000 (5,600 units × USD50 per unit). Initially, the total cost of the goods purchased would be recorded as inventory (an asset) in the amount of USD321,600. During 20X1, the cost of the 5,600 units sold would be expensed (matched against the revenue) while the cost of the 2,000 remaining unsold units would remain in inventory as follows:

Cost of Goods Sold

From the first quarter	2,000 units at USD40 per unit =	USD80,000
From the second quarter	1,500 units at USD41 per unit =	USD61,500
From the third quarter	2,100 units at USD43 per unit =	USD90,300
Total cost of goods sold		USD231,800

Cost of Goods Remaining in Inventory

From the third quarter	100 units at USD43 per unit =	USD4,300
From the fourth quarter	1,900 units at USD45 per unit =	USD85,500
Total remaining (or ending) inventory cost		USD89,800

To confirm that total costs are accounted for: USD231,800 + USD89,800 = USD321,600. The cost of the goods sold would be expensed against the revenue of USD280,000 as follows:

Revenue	USD280,000
Cost of Goods Sold	231,800
Gross Profit	48,200

An alternative way to think about this is that the company created an asset (inventory) of USD321,600 as it made its purchases. At the end of the period, the value of the company's inventory on hand is USD89,800. Therefore, the amount of the Cost of goods sold expense recognized for the period should be the difference: USD231,800.

The remaining inventory amount of USD89,800 will be matched against revenue in a future year when the inventory items are sold.

Period costs, expenditures that less directly match revenues, are generally expensed as incurred (i.e., either when the company makes the expenditure in cash or incurs the liability to pay). Costs associated with administrative, managerial, information technology (IT), and research and development activities as well as the maintenance or repair of assets generally fit this model. For most companies, payroll expenses are accounted for this way, excluding employees whose compensation is considered a product cost and recognized as inventory and later cost of goods sold or items like sales commissions, which are capitalized and expensed systematically or with sales.

Capitalization versus Expensing

Finally, certain expenditures are capitalized as assets on the balance sheet and typically appear as an investing cash outflow on the statement of cash flows. After initial recognition, a company expenses the capitalized amount over the asset's useful life as depreciation or amortization expense (except assets that are not depreciated, i.e., land, or amortized, e.g., intangible assets with indefinite lives). This expense reduces net income on the income statement and reduces the value of the asset on the balance sheet. Depreciation and amortization are non-cash expenses and therefore, apart from their effect on taxable income and taxes payable, they have no impact on the cash flow statement.

This model is a form of the matching principle, whereby expenses are recognized on the income statement over the expected useful life of the investment, so the costs and benefits are “matched.” Example 3 illustrates the impact on the financial statements of capitalizing versus expensing an expenditure.

EXAMPLE 3

General Financial Statement Impact of Capitalizing versus Expensing

Assume two identical (hypothetical) companies, CAP Inc. (CAP) and NOW Inc. (NOW), start with EUR1,000 cash and EUR1,000 common stock. Each year the companies recognize total revenues of EUR1,500 cash and make cash expenditures, excluding an equipment purchase, of EUR500. At the beginning of operations, each company pays EUR900 to purchase equipment. CAP estimates the equipment will have a useful life of three years and an estimated salvage value of EUR0 at the end of the three years. NOW estimates a much shorter useful life and expenses the equipment immediately. The companies have no other assets and make no other asset purchases during the three-year period. Assume the companies pay no dividends, earn zero interest on cash balances, have a tax rate of 30 percent, and use the same accounting method for financial and tax purposes.

The left side of Exhibit 1 shows CAP's financial statements—that is, with the expenditure capitalized and depreciated at EUR300 per year based on the straight-line method of depreciation (EUR900 cost minus EUR0 salvage value equals EUR900, divided by a three-year life equals EUR300 per year). The right side of the exhibit shows NOW's financial statements, with the entire EUR900 expenditure treated as an expense in the first year. All amounts are in euro.

Exhibit 1: Capitalizing versus Expensing

CAP Inc.				NOW Inc.			
Capitalize EUR900 as Asset and Depreciate				Expense EUR900 Immediately			
For Year	1	2	3	For Year	1	2	3
Revenue	1,500	1,500	1,500	Revenue	1,500	1,500	1,500
Cash Expenses	500	500	500	Cash expenses	1,400	500	500
Depreciation	300	300	300	Depreciation	0	0	0
Income before Tax	700	700	700	Income before Tax	100	1,000	1,000
Tax at 30%	210	210	210	Tax at 30%	30	300	300
Net Income	490	490	490	Net Income	70	700	700
Cash from Operations	790	790	790	Cash from Operations	70	700	700
Cash Used in Investing	(900)	0	0	Cash Used in Investing	0	0	0
Total Change in Cash	(110)	790	790	Total Change in Cash	70	700	700

As of	Time 0	End of Year 1	End of Year 2	End of Year 3	Time	Time 0	End of Year 1	End of Year 2	End of Year 3
Cash	1,000	890	1,680	2,470	Cash	1,000	1,070	1,770	2,470
PP&E (net)	—	600	300	—	PP & E (net)	—	—	—	—
Total Assets	1,000	1,490	1,980	2,470	Total Assets	1,000	1,070	1,770	2,470
Retained Earnings	0	490	980	1,470	Retained Earnings	0	70	770	1,470
Common Stock	1,000	1,000	1,000	1,000	Common Stock	1,000	1,000	1,000	1,000
Total Shareholders' Equity	1,000	1,490	1,980	2,470	Total Shareholders' Equity	1,000	1,070	1,770	2,470

1. Which company reports higher net income over the three years? Total cash flow? Cash from operations?

Solution:

Neither company reports higher total net income or cash flow over the three years. The sum of net income over the three years is identical (EUR1,470 total) whether the EUR900 is capitalized or expensed. Also, the sum of the change in cash (EUR1,470 total) is identical under either scenario. CAP reports higher cash from operations by an amount of EUR900 because, under the capitalization scenario, the EUR900 purchase is treated as an investing cash flow.

Note: Because the companies use the same accounting method for both financial and taxable income, absent the assumption of zero interest on cash balances, expensing the EUR900 would have resulted in higher income and cash flow for NOW because the lower taxes paid in the first year (EUR30 versus EUR210) would have allowed NOW to earn interest income on the tax savings.

2. Based on ROE and net profit margin, how does the profitability of the two companies compare?

Solution:

In general, Ending shareholders' equity = Beginning shareholders' equity + Net income + Other comprehensive income – Dividends + Net capital contributions from shareholders. Because the companies in this example do not have other comprehensive income, did not pay dividends, and reported no capital contributions from shareholders, Ending retained earnings = Beginning retained earnings + Net income, and Ending shareholders' equity = Beginning shareholders' equity + Net income.

ROE is calculated as Net income divided by Average shareholders' equity, and Net profit margin is calculated as Net income divided by Total revenue. For example, CAP had Year 1 ROE of 39 percent ($\text{EUR}490 / [(\text{EUR}1,000 + \text{EUR}1,490) / 2]$), and Year 1 net profit margin of 33 percent ($\text{EUR}490 / \text{EUR}1,500$).

CAP Inc.				NOW Inc.			
Capitalize EUR900 as Asset and Depreciate				Expense EUR900 Immediately			
For Year	1	2	3	For Year	1	2	3
ROE	39%	28%	22%	ROE	7%	49%	33%
Net Profit Margin	33%	33%	33%	Net Profit Margin	5%	47%	47%

As shown, compared to expensing, capitalizing results in higher profitability ratios (ROE and net profit margin) in the first year, and lower profitability ratios in subsequent years. For example, CAP's Year 1 ROE of 39 percent was higher than NOW's Year 1 ROE of 7 percent, but in Years 2 and 3, NOW reports superior profitability.

Note also that NOW's superior growth in net income between Year 1 and Year 2 is not attributable to superior performance compared to CAP but rather to the accounting decision to recognize the expense sooner than CAP. In general, all else equal, accounting decisions that result in recognizing expenses sooner will give the appearance of greater subsequent growth. Comparison of the growth of the two companies' net incomes without an awareness of the difference in accounting methods would be misleading. As a corollary, NOW's income and profitability exhibit greater volatility across the three years, not because of more volatile performance but rather because of the different accounting decision.

3. Why does NOW report change in cash of EUR70 in Year 1, while CAP reports total change in cash of (EUR110)?

Solution:

NOW reports an increase in cash of EUR70 in Year 1, while CAP reports a decrease in cash of EUR110 because NOW's taxes were EUR180 lower than CAP's taxes (EUR30 versus EUR210).

Note that this problem assumes the accounting method used by each company for its tax purposes is identical to the accounting method used by the company for its financial reporting. In many countries, companies are allowed to use different depreciation methods for financial reporting and taxes, which may give rise to deferred taxes.

As shown, discretion regarding whether to expense or capitalize expenditures can impede comparability across companies. Example 4 assumes the companies purchase a single asset in one year. Because the sum of net income over the three-year period is identical whether the asset is capitalized or expensed, it illustrates that although capitalizing results in higher profitability compared with expensing in the first year, it results in lower profitability in the subsequent years. Conversely, expensing results in lower profitability in the first year but higher profitability in later years, indicating a favorable trend.

Similarly, shareholders' equity for a company that capitalizes the expenditure will be higher in the early years because the initially higher profits result in initially higher retained earnings. Example 4 assumes the companies purchase a single asset in one year and report identical amounts of total net income over the three-year period, so shareholders' equity (and retained earnings) for the firm that expenses will be identical to shareholders' equity (and retained earnings) for the capitalizing firm at the end of the three-year period.

Although Example 3 shows companies purchasing an asset only in the first year, if a company continues to purchase similar or increasing amounts of assets each year, the profitability-enhancing effect of capitalizing continues if the amount of the expenditures in a period continues to be more than the depreciation expense. Example 4 illustrates this point.

EXAMPLE 4

Impact of Capitalizing versus Expensing for Ongoing Purchases

A company buys a GBP300 computer in Year 1 and capitalizes the expenditure. The computer has a useful life of three years and an expected salvage value of GBP0, so the annual depreciation expense using the straight-line method is GBP100 per year. Compared with expensing the entire GBP300 immediately, the company's pre-tax profit in Year 1 is GBP200 greater.

1. Assume that the company continues to buy an identical computer each year at the same price. If the company uses the same accounting treatment for each of the computers, when does the profit-enhancing effect of capitalizing versus expensing end?

Solution:

The profit-enhancing effect of capitalizing versus expensing would end in Year 3. In Year 3, the depreciation expense on each of the three computers bought in Years 1, 2, and 3 would total GBP300 (GBP100 + GBP100 + GBP100). Therefore, the total depreciation expense for Year 3 will be exactly equal to the capital expenditure in Year 3. The expense in Year 3 would be GBP300, regardless of whether the company capitalized or expensed the annual computer purchases.

2. If the company buys another identical computer in Year 4, using the same accounting treatment as the prior years, what is the effect on Year 4 profits of capitalizing versus expensing these expenditures?

Solution:

There is no impact on Year 4 profits. As in the previous year, the depreciation expense on each of the three computers bought in Years 2, 3, and 4 would total GBP300 (GBP100 + GBP100 + GBP100). Therefore, the total depreciation expense for Year 4 will be exactly equal to the capital expenditure

in Year 4. Pre-tax profits would be reduced by GBP300, regardless of whether the company capitalized or expensed the annual computer purchases.

Compared with expensing an expenditure, capitalizing the expenditure typically results in greater amounts reported as cash from operations. Analysts should be alert to evidence of companies manipulating reported cash flow from operations by capitalizing expenditures that should be expensed.

In summary, holding all else constant, capitalizing an expenditure enhances current profitability and increases reported cash flow from operations. The profitability-enhancing effect of capitalizing continues so long as capital expenditures exceed the depreciation expense. Profitability-enhancing motivations for decisions to capitalize should be considered when analyzing performance. For example, a company may choose to capitalize more expenditures (within the allowable bounds of accounting standards) to achieve earnings targets for a given period. Expensing a cost in the period reduces current period profits but enhances future profitability and thus enhances the profit trend. Profit trend-enhancing motivations should also be considered when analyzing performance. If the company is in a reporting environment that requires identical accounting methods for financial reporting and taxes (unlike the United States, which permits companies to use depreciation methods for reporting purposes that differ from the depreciation method required by tax purposes), then expensing will have a more favorable cash flow impact because paying lower taxes in an earlier period creates an opportunity to earn interest income on the cash saved.

In contrast with these relatively simple examples, it is generally neither possible nor desirable to identify individual instances involving discretion about whether to capitalize or expense expenditures. An analyst can, however, typically identify significant items of expenditure treated differently across companies. The items of expenditure giving rise to the most relevant differences across companies will vary by industry. This cross-industry variation is apparent in the following discussion of the capitalization of expenditures.

CAPITALIZATION VERSUS EXPENSING



1. All else equal, in the fiscal year when long-lived equipment is purchased:

- A. depreciation expense increases.
- B. cash from operations decreases.
- C. net income is reduced by the amount of the purchase.

Solution:

A is correct. In the fiscal year when long-lived equipment is purchased, the assets on the balance sheet increase and depreciation expense on the income statement increases because of the new long-lived asset.

2. Companies X and Z have the same beginning-of-the-year book value of equity and the same tax rate. The companies have identical transactions throughout the year and report all transactions similarly except for one. Both companies acquire a GBP300,000 printer with a three-year useful life and a salvage value of GBP0 on 1 January of the new year. Company X capitalizes the printer and depreciates it on a straight-line basis, and Company

Z expenses the printer. The year-end information in Exhibit 2 is gathered for Company X.

Exhibit 2: Company X Year-End Information

Company X as of 31 December	
Ending Shareholders' Equity	GBP10,000,000
Tax Rate	25%
Dividends	GBP0.00
Net Income	GBP750,000

Based on the information in Exhibit 2, Company Z's return on equity using year-end equity will be *closest* to:

- A. 5.4 percent.
- B. 6.1 percent.
- C. 7.5 percent.

Solution:

B is correct. Company Z's return on equity based on year-end equity value will be 6.1 percent. Company Z will have an additional GBP200,000 of expenses compared with Company X. Company Z expensed the printer for GBP300,000 rather than capitalizing the printer and having a depreciation expense of GBP100,000 like Company X. Company Z's net income and shareholders' equity will be GBP150,000 lower ($= \text{GBP}200,000 \times 0.75$) than that of Company X.

$$\begin{aligned} \text{ROE} &= \left(\frac{\text{Net income}}{\text{Shareholders' Equity}} \right) \\ &= \text{GBP}600,000 / \text{GBP}9,850,000 \\ &= 0.61 = 6.1\%. \end{aligned}$$

The following information relates to questions 3-6.

Melanie Hart, CFA, is a transportation analyst. Hart has been asked to write a research report on Altai Mountain Rail Company (AMRC). Like other companies in the railroad industry, AMRC's operations are capital intensive, with significant investments in such long-lived tangible assets as property, plant, and equipment. In November 2008, AMRC's board of directors hired a new team to manage the company. In reviewing the company's 2009 annual report, Hart is concerned about some of the accounting choices that the new management has made. These choices differ from those of the previous management and from common industry practice. Hart has highlighted the following statements from the company's annual report:

- Statement 1 "In 2009, AMRC spent significant amounts on track replacement and similar improvements. AMRC expensed rather than capitalized a significant proportion of these expenditures."
- Statement 2 "AMRC uses the straight-line method of depreciation for both financial and tax reporting purposes to account for plant and equipment."

Statement 3 “In 2009, AMRC recognized an impairment loss of EUR50 million on a fleet of locomotives. The impairment loss was reported as ‘other income’ in the income statement and reduced the carrying amount of the assets on the balance sheet.”

Exhibit 3 and 4 contain AMRC’s 2009 consolidated income statement and balance sheet. AMRC prepares its financial statements in accordance with International Financial Reporting Standards.

Exhibit 3: Consolidated Statement of Income

	2009		2008	
For the Years Ended 31 December	Euro Millions	Revenues (%)	Euro Millions	Revenues (%)
Operating revenues	2,600	100.0	2,300	100.0
Operating expenses				
Depreciation	(200)	(7.7)	(190)	(8.3)
Other operating expense	(1,590)	(61.1)	(1,515)	(65.9)
Total operating expenses	(1,790)	(68.8)	(1,705)	(74.2)
Operating income	810	31.2	595	25.8
Other income	(50)	(1.9)	—	0.0
Interest expense	(73)	(2.8)	(69)	(3.0)
Income before taxes	687	26.5	526	22.8
Income taxes	(272)	(10.5)	(198)	(8.6)
Net income	415	16	328	14.2

Exhibit 4: Consolidated Balance Sheet

As of 31 December	2009		2008	
Assets	Euro Millions	Assets (%)	Euro Millions	
Current assets	500	9.4	450	8.5
Property and equipment:				
Land	700	13.1	700	13.2
Plant and equipment	6,000	112.1	5,800	109.4
Total property and equipment	6,700	125.2	6,500	122.6
Accumulated depreciation	(1,850)	(34.6)	(1,650)	(31.1)
Net property and equipment	4,850	90.6	4,850	91.5
Total assets	5,350	100.0	5,300	100.0
Liabilities and Shareholders' Equity				
Current liabilities	480	9.0	430	8.1
Long-term debt	1,030	19.3	1,080	20.4
Other long-term provisions and liabilities	1,240	23.1	1,440	27.2
Total liabilities	2,750	51.4	2,950	55.7

Liabilities and Shareholders' Equity

Shareholders' equity				
Common stock and paid-in-surplus	760	14.2	760	14.3
Retained earnings	1,888	35.5	1,600	30.2
Other comprehensive losses	(48)	(0.9)	(10)	(0.2)
Total shareholders' equity	2,600	48.6	2,350	44.3
Total liabilities & shareholders' equity	5,350	100.0	5,300	100.0

3. With respect to Statement 1, which of the following is the *most likely* effect of management's decision to expense rather than capitalize these expenditures?

- A. 2009 net profit margin is higher than if the expenditures had been capitalized.
- B. 2009 total asset turnover is lower than if the expenditures had been capitalized.
- C. Future profit growth will be higher than if the expenditures had been capitalized.

Solution:

C is correct. Expensing rather than capitalizing an investment in long-term assets will result in higher expenses and lower net income and net profit margin in the current year. Future years' incomes will not include depreciation expense related to these expenditures. Consequently, year-to-year growth in profitability will be higher. If the expenses had been capitalized, the carrying amount of the assets would have been higher and the 2009 total asset turnover would have been lower.

4. With respect to Statement 2, what would be the *most likely* effect in 2010 if AMRC were to switch to an accelerated depreciation method for both financial and tax reporting?

- A. Net profit margin would increase.
- B. Total asset turnover would decrease.
- C. Cash flow from operating activities would increase.

Solution:

C is correct. In 2010, switching to an accelerated depreciation method would increase depreciation expense and decrease income before taxes, taxes payable, and net income. Cash flow from operating activities would increase because of the resulting tax savings.

5. With respect to Statement 3, what is the *most likely* effect of the impairment loss?

- A. Net income in years prior to 2009 was likely understated.
- B. Net profit margins in years after 2009 will likely exceed the 2009 net profit margin.

- C. Cash flow from operating activities in 2009 was likely lower due to the impairment loss.

Solution:

B is correct. 2009 net income and net profit margin are lower because of the impairment loss. Consequently, net profit margins in subsequent years are likely to be higher. An impairment loss suggests that insufficient depreciation expense was recognized in prior years, and net income was overstated in prior years. The impairment loss is a non-cash item and will not affect operating cash flows.

6. Based on Exhibit 1 and 2, the *best estimate* of the average remaining useful life of the company's plant and equipment at the end of 2009 is:

- A. 20.75 years.
- B. 24.25 years.
- C. 30.00 years.

Solution:

A is correct. The estimated average remaining useful life is 20.75 years.

Estimate of remaining useful life = Net plant and equipment ÷ Annual depreciation expense

Net plant and equipment = Gross P & E – Accumulated depreciation

$$= €6000 - €1850 = €4150$$

Estimate of remaining useful life = Net P & E ÷ Depreciation expense

$$= €4150 \div €200 = 20.75$$

Capitalization of Interest Costs

Companies generally must capitalize interest costs associated with acquiring or constructing an asset that requires a long period of time to get ready for its intended use.

As a consequence of this accounting treatment, a company's interest costs for a period can appear either on the balance sheet (to the extent they are capitalized) or on the income statement (to the extent they are expensed).

If the interest expenditure is incurred in connection with constructing an asset for the company's own use, the capitalized interest appears on the balance sheet as a part of the relevant long-lived asset. The capitalized interest is expensed over time as the property is depreciated—and is thus part of depreciation expense rather than interest expense. If the interest expenditure is incurred in connection with constructing an asset to sell, for example, by a real estate construction company, the capitalized interest appears on the company's balance sheet as part of inventory. The capitalized interest is then expensed as part of the cost of sales when the asset is sold.

The treatment of capitalized interest poses certain issues that analysts should consider. First, capitalized interest appears as part of investing cash outflows, whereas expensed interest typically reduces operating cash flow. US GAAP-reporting companies are required to categorize interest in operating cash flow, and IFRS-reporting companies can categorize interest in operating, investing, or financing cash flows. Although the treatment is consistent with accounting standards, an analyst may want to examine the impact on reported cash flows. Second, interest coverage ratios are solvency indicators measuring the extent to which a company's earnings (or cash flow) in a period covered its interest costs. To provide a true picture of a company's interest coverage, the entire amount of interest expenditure, both the capitalized portion and the expensed portion, should be used to calculate interest coverage ratios. Additionally,

if a company is depreciating interest that it capitalized in a previous period, income should be adjusted to eliminate the effect of that depreciation. Example 5 illustrates the calculations.

EXAMPLE 5

Effect of Capitalized Interest Costs on Coverage Ratios and Cash Flow

Melco Resorts & Entertainment Limited (NASDAQ: MLCO), a Hong Kong SAR-based casino company, which is listed on the NASDAQ stock exchange and prepares financial reports under US GAAP, disclosed the following information in one of the footnotes to its 2017 financial statements: “Interest and amortization of deferred financing costs associated with major development and construction projects is capitalized and included in the cost of the project. . . . Total interest expenses incurred amounted to \$267,065, \$252,600, and \$253,168, of which \$37,483, \$29,033, and \$134,838 were capitalized during the years ended December 31, 2017, 2016, and 2015, respectively. Amortization of deferred financing costs of \$26,182, \$48,345, and \$38,511, net of amortization capitalized of nil, nil, and \$5,458, were recorded during the years ended December 31, 2017, 2016, and 2015, respectively” (Form 20-F filed 12 April 2018). Cash payments for deferred financing costs were reported in cash flows from financing activities.

Exhibit 5: Melco Resorts and Entertainment Limited Selected Data, as Reported (US dollar thousands)

	2017	2016	2015
EBIT (from income statement)	544,865	298,663	58,553
Interest expense (from income statement)	229,582	223,567	118,330
Capitalized interest (from footnote)	37,483	29,033	134,838
Amortization of deferred financing costs (from footnote)	26,182	48,345	38,511
Net cash provided by operating activities	1,162,500	1,158,128	522,026
Net cash from (used) in investing activities	(410,226)	280,604	(469,656)
Net cash from (used) in financing activities	(1,046,041)	(1,339,717)	(29,688)

Notes: EBIT represents “Income (Loss) Before Income Tax” plus “Interest expenses, net of capitalized interest” from the income statement.

1. Calculate and interpret Melco’s interest coverage ratio with and without capitalized interest.

Solution:

Interest coverage ratios with and without capitalized interest were as follows:

For 2017

2.37 (USD544,865 ÷ USD229,582) without adjusting for capitalized interest; and

2.14 $[(\text{USD}544,865 + \text{USD}26,182) \div (\text{USD}229,582 + \text{USD}37,483)]$, including an adjustment to EBIT for depreciation of previously capitalized interest and an adjustment to interest expense for the amount of interest capitalized in 2017.

For 2016

1.34 $(\text{USD}298,663 \div \text{USD}223,567)$ without adjusting for capitalized interest; and

1.37 $[(\text{USD}298,663 + \text{USD}48,345) \div (\text{USD}223,567 + \text{USD}29,033)]$, including an adjustment to EBIT for depreciation of previously capitalized interest and an adjustment to interest expense for the amount of interest capitalized in 2016.

For 2015

0.49 $(\text{USD}58,533 \div \text{USD}118,330)$ without adjusting for capitalized interest; and

0.38 $[(\text{USD}58,533 + \text{USD}38,511) \div (\text{USD}118,330 + \text{USD}134,838)]$, including an adjustment to EBIT for depreciation of previously capitalized interest and an adjustment to interest expense for the amount of interest capitalized in 2015.

These calculations indicate that Melco's interest coverage improved in 2017 compared with the previous two years. In both 2017 and 2015, the coverage ratio was lower when adjusted for capitalized interest.

2. Calculate Melco's percentage change in operating cash flow from 2016 to 2017. Assuming the financial reporting does not affect reporting for income taxes, what were the effects of capitalized interest on operating and investing cash flows?

Solution:

If the interest had been expensed rather than capitalized, operating cash flows would have been lower in all three years. On an adjusted basis, but not an unadjusted basis, the company's operating cash flow declined in 2017 compared with 2016. On an unadjusted basis, for 2017 compared with 2016, Melco's operating cash flow increased by 0.4 percent in 2017 $[(\text{USD}1,162,500 \div \text{USD}1,158,128) - 1]$. Including adjustments to expense all interest costs, Melco's operating cash flow also decreased by 0.4 percent in 2017 $\{[\text{USD}1,162,500 - \text{USD}37,483] \div (\text{USD}1,158,128 - \text{USD}29,033) - 1\}$. If the interest had been expensed rather than capitalized, financing cash flows would have been higher in all three years.

The treatment of capitalized interest raises issues for consideration by an analyst. First, capitalized interest appears as part of investing cash outflows, whereas expensed interest reduces operating or financing cash flow under IFRS and operating cash flow under US GAAP. An analyst may want to examine the impact on reported cash flows of interest expenditures when comparing companies. Second, interest coverage ratios are solvency indicators measuring the extent to which a company's earnings (or cash flow) in a period covered its interest costs. To provide a true picture of a company's interest coverage, the entire amount of interest, both the capitalized portion and the expensed portion, should be used in calculating interest coverage ratios.

Generally, including capitalized interest in the calculation of interest coverage ratios provides a better assessment of a company's solvency. In assigning credit ratings, rating agencies include capitalized interest in coverage ratios. For example, Standard & Poor's calculates the EBIT interest coverage ratio as EBIT divided by gross interest (defined as interest prior to deductions for capitalized interest or interest income).

Maintaining a minimum interest coverage ratio is a financial covenant often included in lending agreements (e.g., bank loans and bond indentures). The definition of the coverage ratio can be found in the company's credit agreement. The definition is relevant because treatment of capitalized interest in calculating coverage ratios would affect an assessment of how close a company's actual ratios are to the levels specified by its financial covenants and thus the probability of breaching those covenants.

Capitalization of Internal Development Costs

Accounting standards require companies to capitalize software development costs after a product's feasibility is established. Despite this requirement, judgment in determining feasibility means that companies' capitalization practices may differ. For example, as illustrated in Exhibit 6, Microsoft judges product feasibility to be established very shortly before manufacturing begins and, therefore, effectively expenses—rather than capitalizes—research and development costs.

Exhibit 6: Disclosure on Software Development Costs

Excerpt from Management's Discussion and Analysis (MD&A) of Microsoft Corporation, Application of Critical Accounting Policies, Research and Development Costs:

Costs incurred internally in researching and developing a computer software product are charged to expense until technological feasibility has been established for the product. Once technological feasibility is established, all software costs are capitalized until the product is available for general release to customers. Judgment is required in determining when technological feasibility of a product is established. We have determined that technological feasibility for our software products is reached after all high-risk development issues have been resolved through coding and testing. Generally, this occurs shortly before the products are released to production. The amortization of these costs is included in cost of revenue over the estimated life of the products.

Source: Microsoft Corporation, 2017 Annual Report on Form 10-K, p. 45.

Expensing rather than capitalizing development costs results in lower net income in the current period. Expensing rather than capitalizing will continue to result in lower net income so long as the amount of the current-period development expenses is higher than the amortization expense that would have resulted from amortizing prior periods' capitalized development costs—the typical situation when a company's development costs are increasing. On the statement of cash flows, expensing rather than capitalizing development costs results in lower net operating cash flows and higher net investing cash flows. This is because the development costs are reflected as operating cash outflows rather than investing cash outflows.

In comparing the financial performance of a company that expenses most or all software development costs, such as Microsoft, with another company that capitalizes software development costs, adjustments can be made to make the two comparable. For the company that capitalizes software development costs, an analyst can adjust (1) the income statement to include software development costs as an expense and to

exclude amortization of prior years' software development costs; (2) the balance sheet to exclude capitalized software (decrease assets and equity); and (3) the statement of cash flows to decrease operating cash flows and decrease cash used in investing by the amount of the current period development costs. Any ratios that include income, long-lived assets, or cash flow from operations—such as return on equity—also will be affected.

EXAMPLE 6**Software Development Costs**

You are working on a project involving the analysis of JHH Software, a (hypothetical) software development company that established technical feasibility for its first product in 2017. Part of your analysis involves computing certain market-based ratios, which you will use to compare JHH to another company that expenses all of its software development expenditures. Relevant data and excerpts from the company's annual report are included in Exhibit 7.

Exhibit 7: JHH SOFTWARE (US dollar thousands, except per share amounts)**Consolidated Statement of Earnings—Abbreviated**

For Year Ended 31 December:	2018	2017	2016
Total revenue	USD91,424	USD91,134	USD96,293
Total operating expenses	78,107	78,908	85,624
Operating income	13,317	12,226	10,669
Provision for income taxes	3,825	4,232	3,172
Net income	USD9,492	USD7,994	USD7,479
Earnings per share (EPS)	USD1.40	USD0.82	USD0.68

Statement of Cash Flows—Abbreviated

For Year Ended 31 December:	2018	2017	2016
Net cash provided by operating activities	USD15,007	USD14,874	USD15,266
Net cash used in investing activities*	(11,549)	(4,423)	(5,346)
Net cash used in financing activities	(8,003)	(7,936)	(7,157)
Net change in cash and cash equivalents	(USD4,545)	USD2,515	USD2,763
<i>*Includes software development expenses of and includes capital expenditures of</i>	<i>(USD6,000)</i> <i>(USD2,000)</i>	<i>(USD4,000)</i> <i>(USD1,600)</i>	<i>(USD2,000)</i> <i>(USD1,200)</i>

Additional Information:

For Year Ended 31 December:	2018	2017	2016
Market value of outstanding debt	0	0	0
Amortization of capitalized software development expenses	(USD2,000)	(USD667)	0
Depreciation expense	(USD2,200)	(USD1,440)	(USD1,320)

Additional Information:

For Year Ended 31 December:	2018	2017	2016
Market price per share of common stock	USD42	USD26	USD17
Shares of common stock outstanding (thousands)	6,780	9,765	10,999

*Footnote disclosure of accounting policy for software development:
Expenses that are related to the conceptual formulation and design of software products are expensed to research and development as incurred. The company capitalises expenses that are incurred to produce the finished product after technological feasibility has been established.*

1. Compute the following ratios for JHH based on the reported financial statements for fiscal year ended 31 December 2018, with no adjustments. Next, determine the approximate impact on these ratios if the company had expensed rather than capitalized its investments in software. (Assume the financial reporting does not affect reporting for income taxes. There would be no change in the effective tax rate.)

- A. P/E: Price/Earnings per share
- B. P/CFO: Price/Operating cash flow per share
- C. EV/EBITDA: Enterprise value/EBITDA, where enterprise value is defined as the total market value of all sources of a company's financing, including equity and debt, and EBITDA is earnings before interest, taxes, depreciation, and amortization.

Solution:

(US dollars are in thousands, except per share amounts.) JHH's 2019 ratios are presented in the following table:

	Ratios	As reported	As adjusted
A	P/E ratio	30.0	42.9
B	P/CFO	19.0	31.6
C	EV/EBITDA	16.3	24.7

- A. Based on the information as reported, the P/E ratio was 30.0 ($\text{USD}42 \div \text{USD}1.40$). Based on EPS adjusted to expense software development costs, the P/E ratio was 42.9 ($\text{USD}42 \div \text{USD}0.98$).

Price: Assuming that the market value of the company's equity is based on its fundamentals, the price per share is USD42, regardless of a difference in accounting.

EPS: As reported, EPS was USD1.40. Adjusted EPS was USD0.98. Expensing software development costs would have reduced JHH's 2018 operating income by USD6,000, but the company would have reported no amortization of prior years' software costs, which would have increased operating income by USD2,000. The net change of USD4,000 would have reduced operating income from the reported USD13,317 to USD9,317. The effective tax rate for 2018 ($\text{USD}3,825 \div \text{USD}13,317$) is 28.72%, and using this effective tax rate would give an adjusted net income of USD6,641 [$\text{USD}9,317 \times (1 - 0.2872)$], compared to USD9,492 before the adjustment. The EPS would therefore be reduced from the reported USD1.40 to USD0.98 (adjusted net income of USD6,641 divided by 6,780 shares).

- B.** Based on information as reported, the P/CFO was 19.0 ($\text{USD}42 \div \text{USD}2.21$). Based on CFO adjusted to expense software development costs, the P/CFO was 31.6 ($\text{USD}42 \div \text{USD}1.33$).

Price: Assuming that the market value of the company's equity is based on its fundamentals, the price per share is USD42, regardless of a difference in accounting.

CFO per share, as reported, was USD2.21 (total operating cash flows USD15,007 $\div$ 6,780 shares).

CFO per share, as adjusted, was USD1.33. The company's USD6,000 expenditure on software development costs was reported as a cash outflow from investing activities, so expensing those costs would reduce cash from operating activities by USD6,000, from the reported USD15,007 to USD9,007. Dividing adjusted total operating cash flow of USD9,007 by 6,780 shares results in cash flow per share of USD1.33.

- C.** Based on information as reported, the EV/EBITDA was 16.3 ($\text{USD}284,760 \div \text{USD}17,517$). Based on EBITDA adjusted to expense software development costs, the EV/EBITDA was 24.7 ($\text{USD}284,760 \div \text{USD}11,517$).

Enterprise Value: Enterprise value is the sum of the market value of the company's equity and debt. JHH has no debt, and therefore the enterprise value is equal to the market value of its equity. The market value of its equity is USD284,760 ($\text{USD}42 \text{ per share} \times 6,780 \text{ shares}$).

EBITDA, as reported, was USD17,517 (earnings before interest and taxes of USD13,317 plus USD2,200 depreciation plus USD2,000 amortization).

EBITDA, adjusted for expensing software development costs by the inclusion of USD6,000 development expense and the exclusion of USD2,000 amortization of prior expense, would be USD11,517 (earnings before interest and taxes of USD9,317 plus USD2,200 depreciation plus USD0 amortization).

2. Interpret the changes in the ratios.

Solution:

Expensing software development costs would decrease historical profits, operating cash flow, and EBITDA, and would thus increase all market multiples. So JHH's stock would appear to be more expensive if it expensed rather than capitalized the software development costs.

If the unadjusted market-based ratios were used in the comparison of JHH to its competitor that expenses all software development expenditures, then JHH might appear to be under-priced when the difference is solely related to accounting factors. JHH's adjusted market-based ratios provide a better basis for comparison.

For the company in Example 6, current period software development expenditures exceed the amortization of prior periods' capitalized software development expenditures. As a result, expensing rather than capitalizing software development costs would have the effect of lowering income. If, however, software development expenditures slowed such that current expenditures were lower than the amortization of prior periods' capitalized software development expenditures, then expensing software development costs would have the effect of increasing income relative to capitalizing it.

This section illustrated how decisions about capitalizing versus expensing affect financial statements and ratios. Earlier expensing lowers current profits but enhances trends, whereas capitalizing now and expensing later enhances current profits. Having described the accounting for acquisition of long-lived assets, we now turn to the topic of measuring long-lived assets in subsequent periods.

Implications for Financial Analysts: Expense Recognition

As with revenue recognition policies, a company's choice of expense recognition can be characterized by its relative conservatism. A policy that results in recognition of expenses later rather than sooner is considered less conservative. In addition, many items of expense require the company to make estimates that can significantly affect net income. Analysis of a company's financial statements, and particularly comparison of one company's financial statements with those of another, requires an understanding of differences in these estimates and their potential impact.

If, for example, a company shows a significant year-to-year change in its estimates of uncollectible accounts as a percentage of sales, warranty expenses as a percentage of sales, or estimated useful lives of assets, the analyst should seek to understand the underlying reasons. Do the changes reflect a change in business operations (e.g., lower estimated warranty expenses reflecting recent experience of fewer warranty claims because of improved product quality)? Or are the changes seemingly unrelated to changes in business operations and thus possibly a signal that a company is manipulating estimates to achieve a particular effect on its reported net income?

As another example, if two companies in the same industry have dramatically different estimates for uncollectible accounts as a percentage of their sales, warranty expenses as a percentage of sales, or estimated useful lives as a percentage of assets, it is important to understand the underlying reasons. Are the differences consistent with differences in the two companies' business operations (e.g., lower uncollectible accounts for one company reflecting a different, more creditworthy customer base or possibly stricter credit policies)? Another difference consistent with differences in business operations would be a difference in estimated useful lives of assets if one of the companies employs newer equipment. Or, alternatively, are the differences seemingly inconsistent with differences in the two companies' business operations, possibly signaling that a company is manipulating estimates?

Information about a company's accounting policies and significant estimates are described in the notes to the financial statements and in the management discussion and analysis section of a company's annual report.

When possible, the monetary effect of differences in expense recognition policies and estimates can facilitate more meaningful comparisons with a single company's historical performance or across a number of companies. An analyst can use the monetary effect to adjust the reported expenses so that they are on a comparable basis.

Even when the monetary effects of differences in policies and estimates cannot be calculated, it is generally possible to characterize the relative conservatism of the policies and estimates and, therefore, to qualitatively assess how such differences might affect reported expenses and thus financial ratios.

NON-RECURRING ITEMS

4

- ☐ describe the financial reporting treatment and analysis of non-recurring items (including discontinued operations, unusual or infrequent items) and changes in accounting policies

From a company's income statements, we can see its earnings from the year just ended and the previous year. Looking forward, the question is: What will the company earn next year and in the years thereafter?

To assess a company's future earnings, it is helpful to separate those prior years' items of income and expense that are likely to continue in the future from those items that are less likely to continue. Some items from prior years are clearly not expected to continue in the future periods and are separately disclosed on a company's income statement. IFRS describe considerations that enter into the decision to present information other than that explicitly specified by a standard. Both IFRS and US GAAP specify that the results of discontinued operations should be reported separately from continuing operations. Other items that may be reported separately on a company's income statement, such as unusual items, items that occur infrequently, effects due to accounting changes, and non-operating income, require the analyst to make some judgments.

Unusual or Infrequent Items

IFRS require that items of income or expense that are material or relevant to the understanding of the entity's financial performance should be disclosed separately. Unusual or infrequent items are likely to meet these criteria. Under US GAAP, material items that are unusual or infrequent, and that are both as of reporting periods beginning after December 15, 2015, are shown as part of a company's continuing operations but are presented separately. For example, restructuring charges, such as costs to close plants and employee termination costs, are considered part of a company's ordinary activities. As another example, gains and losses arising when a company sells an asset or part of a business, for more or less than its carrying value, are also disclosed separately on the income statement. These sales are considered ordinary business activities.

Highlighting the unusual or infrequent nature of these items assists an analyst in judging the likelihood that such items will reoccur. This meets the IFRS criteria of disclosing items that are relevant to the understanding of an entity's financial performance. In Exhibit 8, the income statement of Danone shows an amount for "Recurring operating income" followed by a separate line item for "other operating income (expense)," which is not included as a component of recurring income. Exhibit 9 presents an excerpt from Danone's additional disclosure about this non-recurring amount.

Exhibit 8: Danone Income Statement

Groupe Danone Consolidated Income Statement (in Millions of Euros) [Excerpt]

	Year Ended 31 December	
	2016	2017
Sales	21,944	24,677
Cost of goods sold	(10,744)	(12,459)

Groupe Danone Consolidated Income Statement (in Millions of Euros) [Excerpt]

	Year Ended 31 December	
	2016	2017
Selling expense	(5,562)	(5,890)
General and administrative expense	(2,004)	(2,225)
Research and development expense	(333)	(342)
Other income (expense)	(278)	(219)
Recurring operating income	3,022	3,543
Other operating income (expense)	(99)	192
Operating income	2,923	3,734
Interest income on cash equivalents and short-term investments	130	151
Interest expense	(276)	(414)
Cost of net debt	(146)	(263)
Other financial income	67	137
Other financial expense	(214)	(312)
Income before tax	2,630	3,296
Income tax expense	(804)	(842)
Net income from fully consolidated companies	1,826	2,454
Share of profit of associates	1	109
Net income	1,827	2,563
 Net income – Group share	 1,720	 2,453
Net income – Non-controlling interests	107	110

Exhibit 9: Highlighting Infrequent Nature of Items—Excerpt from Groupe Danone footnotes to its 2017 financial statements**NOTE 6. Events and Transactions Outside the Group's Ordinary Activities [Excerpt]**

Other operating income (expense) is defined under Recommendation 2013-03 of the French CNC relating to the format of consolidated financial statements prepared under international accounting standards, and comprises significant items that, because of their exceptional nature, cannot be viewed as inherent to Danone's current activities. These mainly include capital gains and losses on disposals of fully consolidated companies, impairment charges on goodwill, significant costs related to strategic restructuring and major external growth transactions, and incurred or estimated costs related to major crises and major litigation. Furthermore, in connection with Revised IFRS 3 and Revised IAS 27, Danone also classifies in Other operating income (expense) (i) acquisition costs related to business combinations, (ii) revaluation profit or loss accounted for following a loss of control, and (iii) changes in earn-outs related to business combinations and subsequent to the acquisition date.

In 2017, the net Other operating income of €192 million consisted mainly of the following items:

(Euro Millions)	Related Income (Expense)
Capital gain on disposal of Stonyfield	628
Compensation received following the decision of the Singapore arbitration court in the Fonterra case	105
Territorial risks, mainly in certain countries in the ALMA region	(148)
Costs associated with the integration of WhiteWave	(118)
Impairment of several intangible assets in Waters and Specialized Nutrition Reporting entities	(115)

Remainder of table omitted

In Exhibit 9, Danone provides details on items considered to be “exceptional” items and not “inherent” to the company’s current activities. The exceptional items include gains on asset disposals, receipts from a legal case, costs of integrating an acquisition, and impairment of intangible assets, among others. Generally, in forecasting future operations, an analyst would assess whether the items reported are likely to reoccur and also possible implications for future earnings. It is generally not advisable simply to ignore all unusual items.

Discontinued Operations

When a company disposes of or establishes a plan to dispose of one of its component operations and will have no further involvement in the operation, the income statement reports separately the effect of this disposal as a “discontinued” operation under both IFRS and US GAAP. Financial standards provide various criteria for reporting the effect separately, which are generally that the discontinued component must be separable both physically and operationally.

Results of discontinued operations are presented on a net basis at the bottom of the income statement, including on a per share basis. The remaining parts of income statement (e.g., revenue, costs of goods sold, EPS from the remaining businesses) are the results of continuing operations and are disclosed as such. Assets and liabilities related to the discontinued operations are aggregated and recognized on the balance sheet as held for sale. This presentation allows an analyst to clearly evaluate continuing versus discontinued operations.

Because the discontinued operation will no longer provide earnings (or cash flow) to the company once the sale or disposal is complete, an analyst may eliminate discontinued operations in formulating expectations about a company’s future financial performance after a certain date.

Changes in Accounting Policy

At times, standard setters issue new standards that require companies to change accounting policies. Depending on the standard, companies may be permitted to adopt the standards prospectively (in the future) or retrospectively (restate financial statements as though the standard existed in the past). In other cases, changes in accounting policies (e.g., from one acceptable inventory costing method to another)

are made by management for various reasons, such as providing a better reflection of the company's performance. Changes in accounting policies are reported through retrospective application¹ unless it is impractical to do so.

Retrospective application means that the financial statements for all fiscal years shown in a company's financial report are presented as if the newly adopted accounting principle had been used throughout the entire period. Notes to the financial statements describe the change and explain the justification for the change. Because changes in accounting principles are retrospectively applied, the financial statements that appear within a financial report are comparable.

Example 7 presents an excerpt from Microsoft Corporation's Form 10-K for the fiscal year ended 30 June 2018 describing a change in accounting principle resulting from the new revenue recognition standard. Microsoft elected to adopt the new standard 1 July 2017, earlier than the required adoption date. Microsoft also elected to use the "full retrospective method," which requires companies to restate prior periods' results. On its income statement, both 2016 and 2017 are presented as if the new standard had been used throughout both years. In the footnotes to its financial statements, Microsoft discloses the impact of the new standard.

EXAMPLE 7

Microsoft Corporation—Excerpt from Footnotes to the Financial Statements

The most significant impact of the [new revenue recognition] standard relates to our accounting for software license revenue. Specifically, for Windows 10, we recognize revenue predominantly at the time of billing and delivery rather than ratably over the life of the related device. For certain multi-year commercial software subscriptions that include both distinct software licenses and SA, we recognize license revenue at the time of contract execution rather than over the subscription period. Due to the complexity of certain of our commercial license subscription contracts, the actual revenue recognition treatment required under the standard depends on contract-specific terms and in some instances may vary from recognition at the time of billing. Revenue recognition related to our hardware, cloud offerings (such as Office 365), LinkedIn, and professional services remains substantially unchanged. Refer to Impacts to Previously Reported Results below for the impact of adoption of the standard in our consolidated financial statements.

Exhibit 10: Microsoft Impacts to Previously Reported Results

(US dollar millions, except per share amounts)	As Previously Reported	New Revenue Standard Adjustment	As Restated
Income Statements			
Year Ended 30 June 2017			
Revenue	89,950	6,621	96,571
Provision for income taxes	1,945	2,467	4,412
Net income	21,204	4,285	25,489
Diluted earnings per share	2.71	0.54	3.25
Year Ended 30 June 2016			

¹ IAS No. 8, Accounting Policies, Changes in Accounting Estimates and Errors, and FASB ASC Topic 250 [Accounting Changes and Error Corrections].

(US dollar millions, except per share amounts)	As Previously Reported	New Revenue Standard Adjustment	As Restated
Revenue	85,320	5,834	91,154
Provision for income taxes	2,953	2,147	5,100
Net income	16,798	3,741	20,539
Diluted earnings per share	2.1	0.46	2.56

1. Based on Exhibit 10, describe whether Microsoft's results appear better or worse under the new revenue recognition standard.

Solution:

Microsoft's results appear better under the new revenue recognition standard. Revenues and income are higher under the new standard. The net profit margin is higher under the new standard. For 2017, the net profit margin is 26.4 percent ($= 25,489/96,571$) under the new standard versus 23.6 percent ($= 21,204/89,950$) under the old standard. Reported revenue grew faster under the new standard. Revenue growth under the new standard was 5.9 percent [$= (96,571/91,154) - 1$] compared with 5.4 percent [$= (89,950/85,320) - 1$] under the old standard.

Microsoft's presentation of the effects of the new revenue recognition enables an analyst to identify the impact of the change in accounting standards.

Note that the new revenue recognition standard also offered companies the option of using a "modified retrospective" method of adoption. Under the modified retrospective approach, companies were not required to revise previously reported financial statements. Instead, they adjusted opening balances of retained earnings (and other applicable accounts) for the cumulative impact of the new standard.

In contrast to changes in accounting policies (such as whether to expense the cost of employee stock options), companies sometimes make *changes in accounting estimates* (such as the useful life of a depreciable asset). Changes in accounting estimates are handled prospectively, with the change affecting the financial statements for the period of change and future periods. No adjustments are made to prior statements, and the adjustment is not shown on the face of the income statement. Significant changes should be disclosed in the notes. Exhibit 11 provides an excerpt from the annual Form 10-K of Catalent Inc., a US-based biotechnology company, that illustrates a change in accounting estimate.

Exhibit 11: Change in Accounting Estimate—Excerpt from Catalent Form 10-K

Catalent Inc. discloses a change in the method it uses to calculate both annual expenses related to its defined benefit pension plans. Rather than use a single, weighted-average discount rate in its calculations, the company will use the spot rates applicable to each projected cash flow.

Post-Retirement and Pension Plans

The measurement of the related benefit obligations and the net periodic benefit costs recorded each year are based upon actuarial computations, which require management's judgment as to certain assumptions. These assumptions include the discount rates used in computing the present value of the benefit obligations and the net periodic benefit costs...

Effective June 30, 2016, the approach used to estimate the service and interest components of net periodic benefit cost for benefit plans was changed to provide a more precise measurement of service and interest costs. Historically, the Company estimated these service and interest components utilizing a single weighted-average discount rate derived from the yield curve used to measure the benefit obligation at the beginning of the period. Going forward, the Company has elected to utilize an approach that discounts the individual expected cash flows using the applicable spot rates derived from the yield curve over the projected cash flow period. The Company has accounted for this change as a change in accounting estimate that is inseparable from a change in accounting principle and accordingly has accounted for it prospectively.

Another possible adjustment is a *correction of an error for a prior period* (e.g., in financial statements issued for an earlier year). This cannot be handled by simply adjusting the current period income statement. Correction of an error for a prior period is handled by restating the financial statements (including the balance sheet, statement of owners' equity, and cash flow statement) for the prior periods presented in the current financial statements. Note that disclosures are required regarding the error. These disclosures should be examined carefully because they may reveal weaknesses in the company's accounting systems and financial controls.

Changes in Scope and Exchange Rates

When an issuer acquires a controlling interest in another company, it consolidates its financial statements as of the closing date. Depending on the size of the target relative to the acquirer, an acquisition can materially affect the comparability of the acquirer's financial results and position from prior periods. Additionally, changes in exchange rates often affect multinational companies' income statements (e.g., a strengthening functional currency against the reporting currency increases reported revenues, while a declining functional currency against the reporting currency decreases reported revenues). Unfortunately, accounting standards do *not* require issuers to disclose the effects of either scope or exchange rate changes on the financial statements or in individual items, although most issuers disclose useful summary information (such as revenue and EPS growth rates excluding scope and exchange rate changes) in management reporting or elsewhere.

The financial statement implications of changes in scope and exchange rates will be discussed in detail later in the curriculum.

5

EARNINGS PER SHARE



describe how earnings per share is calculated and calculate and interpret a company's basic and diluted earnings per share for companies with simple and complex capital structures including those with antidilutive securities

One income statement metric of particular importance to equity investors is earnings per share (EPS). IFRS require the presentation of EPS on the face of the income statement for net profit or loss (net income) and profit or loss (income) from continuing

operations and similar presentation is required under US GAAP. This lesson outlines the calculations for EPS and explains how the calculation differs for a simple versus complex capital structure.

Simple versus Complex Capital Structure

A company's capital is composed of its equity and debt. Some types of equity have preference over others, and some debt (and other instruments) may be converted into equity. Under IFRS, the type of equity for which EPS is presented is referred to as ordinary. **Ordinary shares** are those equity shares that are subordinate to all other types of equity. The ordinary shareholders are basically the owners of the company—the equity holders who are paid last in a liquidation of the company and who benefit the most when the company does well. Under US GAAP, this ordinary equity is referred to as **common stock** or **common shares**, reflecting US language usage. The terms “ordinary shares,” “common stock,” and “common shares” are used interchangeably in the following discussion.

When a company has issued any financial instruments that are potentially convertible into common stock, it is said to have a complex capital structure. Examples of financial instruments that are potentially convertible into common stock include convertible bonds, convertible preferred stock, employee stock options, and warrants (a warrant is essentially an equity call option issued by the company; a warrant holder has the right but not the obligation to purchase newly issued shares at the exercise price). If a company's capital structure does not include such potentially convertible financial instruments, it is said to have a simple capital structure.

The distinction between simple versus complex capital structure is relevant to the calculation of EPS because financial instruments that are potentially convertible into common stock could, as a result of conversion or exercise, potentially dilute (i.e., decrease) EPS. Information about such a potential dilution is valuable to a company's current and potential shareholders; therefore, accounting standards require companies to disclose what their EPS would be if all dilutive financial instruments were converted into common stock. The EPS that would result if all dilutive financial instruments were converted is called **diluted EPS**. In contrast, **basic EPS** is calculated using the reported earnings available to common shareholders of the parent company and the weighted average number of shares outstanding.

Companies are required to report both basic and diluted EPS as well as amounts for continuing operations. Exhibit 12 shows the per share amounts reported by AB InBev at the bottom of its income statement. The company's basic EPS (“before dilution”) was USD4.06, and diluted EPS (“after dilution”) was USD3.98 for 2017. In addition, in the same way that AB InBev's income statement shows income from continuing operations separately from total income, EPS from continuing operations is also shown separately from total EPS. For 2017, the basic and diluted EPS from continuing operations were USD4.04 and USD3.96, respectively. Across all measures, AB InBev's EPS was much higher in 2017 than in 2016. An analyst would seek to understand the causes underlying the changes in EPS, a topic we will address following an explanation of the calculations of both basic and diluted EPS.

Exhibit 12: AB InBev's Earnings per Share (USD)

	12 Months Ended 31 December		
	2017	2016	2015
Basic earnings per share	4.06	0.72	5.05
Diluted earnings per share	3.98	0.71	4.96
Basic earnings per share from continuing operations	4.04	0.69	5.05
Diluted earnings per share from continuing operations	3.96	0.68	4.96

Basic EPS

Basic EPS is the amount of income available to common shareholders divided by the weighted average number of common shares outstanding over a period. The amount of income available to common shareholders is the amount of net income remaining after preferred dividends (if any) have been paid. Thus, the formula to calculate basic EPS is as follows:

$$\text{Basic EPS} = \frac{\text{Net income} - \text{Preferred dividends}}{\text{Weighted average number of shares outstanding}}$$

The weighted average number of shares outstanding is a time weighting of common shares outstanding. For example, assume a company began the year with 2,000,000 common shares outstanding and repurchased 100,000 common shares on 1 July. The weighted average number of common shares outstanding would be the sum of 2,000,000 shares $\times$ 1/2 year + 1,900,000 shares $\times$ 1/2 year, or 1,950,000 shares. So, the company would use 1,950,000 shares as the weighted average number of shares in calculating its basic EPS.

If the number of shares of common stock increases as a result of a stock dividend or a stock split, the EPS calculation reflects the change retroactively to the beginning of the period.

Example 8, 9, and 10 illustrate the computation of basic EPS.

EXAMPLE 8**A Basic EPS Calculation (1)**

- For the year ended 31 December 2018, Shopalot Company had net income of USD1,950,000. The company had 1,500,000 shares of common stock outstanding, no preferred stock, and no convertible financial instruments. What is Shopalot's basic EPS?

Solution:

Shopalot's basic EPS is USD1.30 (USD1,950,000 divided by 1,500,000 shares).

EXAMPLE 9**A Basic EPS Calculation (2)**

For the year ended 31 December 2018, Angler Products had net income of USD2,500,000. The company declared and paid USD200,000 of dividends on preferred stock. The company also had the common stock share information shown in Exhibit 13:

Exhibit 13: Angler's Common Stock Shares

Shares outstanding on 1 January 2018	1,000,000
Shares issued on 1 April 2018	200,000
Shares repurchased (treasury shares) on 1 October 2018	(100,000)
Shares outstanding on 31 December 2018	1,100,000

1. What is the company's weighted average number of shares outstanding?

Solution:

The weighted average number of shares outstanding is determined by the length of time each quantity of shares was outstanding:

$1,000,000 \times (3 \text{ months}/12 \text{ months}) =$	250,000
$1,200,000 \times (6 \text{ months}/12 \text{ months}) =$	600,000
$1,100,000 \times (3 \text{ months}/12 \text{ months}) =$	275,000
Weighted average number of shares outstanding	1,125,000

2. What is the company's basic EPS?

Solution:

Basic EPS = (Net income – Preferred dividends)/Weighted average number of shares = $(\text{USD}2,500,000 - \text{USD}200,000)/1,125,000 = \text{USD}2.04$

EXAMPLE 10**A Basic EPS Calculation (3)**

1. Assume the same facts as Example 7 except that on 1 December 2018, a previously declared 2-for-1 stock split took effect. Each shareholder of record receives two shares in exchange for each current share that he or she owns. What is the company's basic EPS?

Solution:

For EPS calculation purposes, a stock split is treated as if it occurred at the beginning of the period. The weighted average number of shares would, therefore, be 2,250,000, and the basic EPS would be USD1.02 [= $(\text{USD}2,500,000 - \text{USD}200,000)/2,250,000$].

Diluted EPS: The If-Converted Method

If a company has a simple capital structure (in other words, one that includes no potentially dilutive financial instruments), then its basic EPS is equal to its diluted EPS. If, however, a company has potentially dilutive financial instruments, its diluted EPS may differ from its basic EPS. Diluted EPS, by definition, is always equal to or less than basic EPS. The following sections describe the effects of three types of potentially dilutive financial instruments on diluted EPS: convertible preferred, convertible debt, and employee stock options. The final section explains why not all potentially dilutive financial instruments actually result in a difference between basic and diluted EPS.

Diluted EPS When a Company Has Convertible Preferred Stock Outstanding

When a company has convertible preferred stock outstanding, diluted EPS is calculated using the **if-converted method**. The if-converted method is based on what EPS would have been if the convertible preferred securities had been converted at the beginning of the period. In other words, the method calculates what the effect would have been if the convertible preferred shares converted at the beginning of the period. If the convertible shares had been converted, there would be two effects. First, the convertible preferred securities would no longer be outstanding; instead, additional common stock would be outstanding. Thus, under the if-converted method, the weighted average number of shares outstanding would be higher than in the basic EPS calculation. Second, if such a conversion had taken place, the company would not have paid preferred dividends. Thus, under the if-converted method, the net income available to common shareholders would be higher than in the basic EPS calculation.

Diluted EPS using the if-converted method for convertible preferred stock is equal to net income divided by the weighted average number of shares outstanding from the basic EPS calculation plus the additional shares of common stock that would be issued upon conversion of the preferred. Thus, the formula to calculate diluted EPS using the if-converted method for preferred stock is as follows:

$$\text{Diluted EPS} = \frac{(\text{Net income})}{(\text{Weighted average number of shares outstanding} + \text{New common shares that would have been issued at conversion})}$$

A diluted EPS calculation using the if-converted method for preferred stock is provided in Example 11.

EXAMPLE 11

A Diluted EPS Calculation Using the If-Converted Method for Preferred Stock

1. For the year ended 31 December 2018, Bright-Warm Utility Company (fictitious) had net income of USD1,750,000. The company had an average of 500,000 shares of common stock outstanding, 20,000 shares of convertible preferred, and no other potentially dilutive securities. Each share of preferred pays a dividend of USD10 per share, and each is convertible into five

shares of the company's common stock. Calculate the company's basic and diluted EPS.

Solution:

If the 20,000 shares of convertible preferred had each converted into five shares of the company's common stock, the company would have had an additional 100,000 shares of common stock (five shares of common for each of the 20,000 shares of preferred). If the conversion had taken place, the company would not have paid preferred dividends of USD200,000 (USD10 per share for each of the 20,000 shares of preferred). As shown in Exhibit 14, the company's basic EPS was USD3.10 and its diluted EPS was USD2.92.

Exhibit 14: Calculation of Diluted EPS for Bright-Warm Utility Company Using the If-Converted Method: Case of Preferred Stock

	Basic EPS	Diluted EPS Using If-Converted Method
Net income	USD1,750,000	USD1,750,000
Preferred dividend	-200,000	0
Numerator	USD1,550,000	USD1,750,000
Weighted average number of shares outstanding	500,000	500,000
Additional shares issued if preferred converted	0	100,000
Denominator	500,000	600,000
EPS	USD3.10	USD2.92

Diluted EPS When a Company Has Convertible Debt Outstanding

When a company has convertible debt outstanding, the diluted EPS calculation also uses the if-converted method. Diluted EPS is calculated as if the convertible debt had been converted at the beginning of the period. If the convertible debt had been converted, the debt securities would no longer be outstanding; instead, additional shares of common stock would be outstanding. Also, if such a conversion had taken place, the company would not have paid interest on the convertible debt, so the net income available to common shareholders would increase by the after-tax amount of interest expense on the debt converted.

Thus, the formula to calculate diluted EPS using the if-converted method for convertible debt is as follows:

$$\text{Diluted EPS} = \frac{(\text{Net income} + \text{After-tax interest on convertible debt} - \text{Preferred dividends})}{(\text{Weighted average number of shares outstanding} + \text{Additional common shares that would have been issued at conversion})}$$

A diluted EPS calculation using the if-converted method for convertible debt is provided in Example 12.

EXAMPLE 12**A Diluted EPS Calculation Using the If-Converted Method for Convertible Debt**

1. Oppnox Company (fictitious) reported net income of USD750,000 for the year ended 31 December 2018. The company had a weighted average of 690,000 shares of common stock outstanding. In addition, the company has only one potentially dilutive security: USD50,000 of 6 percent convertible bonds, convertible into a total of 10,000 shares. Assuming a tax rate of 30 percent, calculate Oppnox's basic and diluted EPS.

Solution:

If the debt securities had been converted, the debt securities would no longer be outstanding and instead, an additional 10,000 shares of common stock would be outstanding. Also, if the debt securities had been converted, the company would not have paid interest of USD3,000 on the debt, so net income available to common shareholders would have increased by USD2,100 [= USD3,000(1 – 0.30)] on an after-tax basis. Exhibit 15 illustrates the calculation of diluted EPS using the if-converted method for convertible debt.

Exhibit 15: Calculation of Diluted EPS for Oppnox Company Using the If-Converted Method: Case of a Convertible Bond

	Basic EPS	Diluted EPS Using If-Converted Method
Net income	USD750,000	USD750,000
After-tax cost of interest		2,100
Numerator	USD750,000	USD752,100
Weighted average number of shares outstanding	690,000	690,000
If converted	0	10,000
Denominator	690,000	700,000
EPS	USD1.09	USD1.07

Diluted EPS: The Treasury Stock Method

When a company has stock options, warrants, or their equivalents outstanding, diluted EPS is calculated as if the financial instruments had been exercised and the company had used the proceeds from exercise to repurchase as many shares of common stock as possible at the average market price of common stock during the period. The weighted average number of shares outstanding for diluted EPS is thus increased by the number of shares that would be issued upon exercise minus the number of shares that would have been purchased with the proceeds. This method is called the treasury stock method under US GAAP because companies typically hold repurchased shares as treasury stock. The same method is used under IFRS but is not named.

For the calculation of diluted EPS using this method, the assumed exercise of these financial instruments would have the following effects:

- The company is assumed to receive cash upon exercise and, in exchange, to issue shares.
- The company is assumed to use the cash proceeds to repurchase shares at the weighted average market price during the period.

As a result of these two effects, the number of shares outstanding would increase by the incremental number of shares issued (the difference between the number of shares issued to the holders and the number of shares assumed to be repurchased by the company). For calculating diluted EPS, the incremental number of shares is weighted based upon the length of time the financial instrument was outstanding in the year. If the financial instrument was issued before the beginning of the year, the weighted average number of shares outstanding increases by the incremental number of shares. If the financial instruments were issued during the year, then the incremental shares are weighted by the amount of time the financial instruments were outstanding during the year.

The assumed exercise of these financial instruments would not affect net income. For calculating EPS, therefore, no change is made to the numerator. The formula to calculate diluted EPS using the treasury stock method (same method as used under IFRS but not named) for options is as follows:

$$\text{Diluted EPS} = \frac{(\text{Net income} - \text{Preferred dividends})}{[\text{Weighted average number of shares outstanding} + (\text{New shares that would have been issued at option exercise} - \text{Shares that could have been purchased with cash received upon exercise}) \times (\text{Proportion of year during which the financial instruments were outstanding})]}$$

A diluted EPS calculation using the treasury stock method for options is provided in Example 13.

EXAMPLE 13

A Diluted EPS Calculation Using the Treasury Stock Method for Options

1. Hihotech Company (fictitious) reported net income of USD2.3 million for the year ended 30 June 2018 and had a weighted average of 800,000 common shares outstanding. At the beginning of the fiscal year, the company has outstanding 30,000 options with an exercise price of USD35. No other potentially dilutive financial instruments are outstanding. Over the fiscal year, the company's market price has averaged USD55 per share. Calculate the company's basic and diluted EPS.

Solution:

Using the treasury stock method, we first calculate that the company would have received USD1,050,000 (USD35 for each of the 30,000 options exercised) if all the options had been exercised. The options would no longer be outstanding; instead, 30,000 shares of common stock would be outstanding. Under the treasury stock method, we assume that shares would be repurchased with the cash received upon exercise of the options. At an average market price of USD55 per share, the USD1,050,000 proceeds from option exercise, the company could have repurchased 19,091 shares. Therefore, the

incremental number of shares issued is 10,909 (calculated as 30,000 minus 19,091). For the diluted EPS calculation, no change is made to the numerator. As shown in Exhibit 16, the company's basic EPS was USD2.88 and the diluted EPS was USD2.84.

Exhibit 16: Calculation of Diluted EPS for Hihotech Company Using the Treasury Stock Method: Case of Stock Options

	Basic EPS	Diluted EPS Using Treasury Stock Method
Net income	USD2,300,000	USD2,300,000
Numerator	USD2,300,000	USD2,300,000
Weighted average number of shares outstanding	800,000	800,000
If converted	0	10,909
Denominator	800,000	810,909
EPS	USD2.88	USD2.84

As noted, IFRS require a similar computation but does not refer to it as the “treasury stock method.” The company is required to consider that any assumed proceeds are received from the issuance of new shares at the average market price for the period. These new “inferred” shares would be disregarded in the computation of diluted EPS, but the excess of the new shares that would be issued under options contracts minus the new inferred shares would be added to the weighted average number of shares outstanding. The results are the same as the treasury stock method, as shown in Example 14.

EXAMPLE 14

Diluted EPS for Options under IFRS

1. Assuming the same facts given in Example 13, calculate the weighted average number of shares outstanding for diluted EPS under IFRS.

Solution:

If the options had been exercised, the company would have received USD1,050,000. If this amount had been received from the issuance of new shares at the average market price of USD55 per share, the company would have issued 19,091 shares. IFRS refer to the 19,091 shares the company would have issued at market prices as the inferred shares. The number of shares issued under options (30,000) minus the number of inferred shares (19,091) equals 10,909. This amount is added to the weighted average number of shares outstanding of 800,000 to get diluted shares of 810,909. Note that this is the same result as that obtained under US GAAP; it is just derived in a different manner.

Other Issues with Diluted EPS and Changes in EPS

It is possible that some potentially convertible securities could be **antidilutive** (i.e., their inclusion in the computation would result in an EPS higher than the company's basic EPS). Under IFRS and US GAAP, antidilutive securities are not included in the calculation of diluted EPS. Diluted EPS should reflect the maximum potential dilution from conversion or exercise of potentially dilutive financial instruments. Diluted EPS will always be less than or equal to basic EPS. Example 15 provides an illustration of an antidilutive security.

EXAMPLE 15

An Antidilutive Security

- For the year ended 31 December 2018, Dim-Cool Utility Company (fictitious) had net income of USD1,750,000. The company had an average of 500,000 shares of common stock outstanding, 20,000 shares of convertible preferred, and no other potentially dilutive securities. Each share of preferred pays a dividend of USD10 per share, and each is convertible into three shares of the company's common stock. What was the company's basic and diluted EPS?

Solution:

If the 20,000 shares of convertible preferred had each converted into three shares of the company's common stock, the company would have had an additional 60,000 shares of common stock (three shares of common for each of the 20,000 shares of preferred). If the conversion had taken place, the company would not have paid preferred dividends of USD200,000 (USD10 per share for each of the 20,000 shares of preferred). The effect of using the if-converted method would be EPS of USD3.13, as shown in Exhibit 17. Because this is greater than the company's basic EPS of USD3.10, the securities are said to be antidilutive and the effect of their conversion would not be included in diluted EPS. Diluted EPS would be the same as basic EPS (i.e., USD3.10).

Exhibit 17: Calculation for an Antidilutive Security

	Basic EPS	Diluted EPS Using If-Converted Method
Net income	USD1,750,000	USD1,750,000
Preferred dividend	–200,000	0
Numerator	USD1,550,000	USD1,750,000
Weighted average number of shares outstanding	500,000	500,000
If converted	0	60,000

	Basic EPS	Diluted EPS Using If-Converted Method	
Denominator	500,000	560,000	
EPS	USD3.10	USD3.13	←Exceeds basic EPS; security is antidilutive and, therefore, not included. Reported diluted EPS= USD3.10.

Changes in EPS

Having explained the calculations of both basic and diluted EPS, we return to an examination of changes in EPS. As noted in Exhibit 12, AB InBev's fully diluted EPS from continuing operations increased from USD0.68 in 2016 to USD3.96 in 2017. In general, an increase in EPS results from an increase in net income, a decrease in the number of shares outstanding, or a combination of both. In the notes to its financial statements (not shown), AB InBev discloses that the weighted average number of shares for both the basic and fully diluted calculations was greater in 2017 than in 2016. Thus, for AB InBev, the improvement in EPS from 2016 to 2017 was driven by an increase in net income. Changes in the numerator and denominator explain the changes in EPS arithmetically. To understand the business drivers of those changes requires further research. Lesson 5 presents analytical tools that an analyst can use to highlight areas for further examination.

6

INCOME STATEMENT RATIOS AND COMMON-SIZE ANALYSIS



evaluate a company's financial performance using common-size income statements and financial ratios based on the income statement

In this lesson, we apply two analytical tools to analyze the income statement: common-size analysis and income statement ratios. The objective of this analysis is to assess over a period of time a company's performance relative to its own past performance or to that of another company.

Common-Size Analysis of the Income Statement

Common-size analysis of the income statement can be performed by stating each line item on the income statement as a percentage of revenue. Common-size statements facilitate comparison across time periods (time series analysis) and across companies (cross-sectional analysis) because the standardization of each line item removes the effect of size.

To illustrate, Panel A of Exhibit 18 presents an income statement for three hypothetical companies in the same industry. Company A and Company B, each with USD10 million in sales, are larger (as measured by sales) than Company C, which has only USD2 million in sales. In addition, Companies A and B both have higher operating profit: USD2 million and USD1.5 million, respectively, compared with Company C's operating profit of only USD400,000.

How can an analyst meaningfully compare the performance of these companies? By preparing a common-size income statement, as illustrated in Panel B, an analyst can readily see that the percentages of Company C's expenses and profit relative to its sales are exactly the same as for Company A. Furthermore, although Company C's operating profit is lower than Company B's in absolute dollars, it is higher in percentage terms (20 percent for Company C compared with only 15 percent for Company B). For each USD100 of sales, Company C generates USD5 more operating profit than Company B. In other words, Company C is relatively more profitable than Company B based on this measure.

The common-size income statement also highlights differences in companies' strategies. Comparing the two larger companies, Company A reports significantly higher gross profit as a percentage of sales than does Company B (70 percent compared with 25 percent). Given that both companies operate in the same industry, why can Company A generate so much higher gross profit? One possible explanation is found by comparing the operating expenses of the two companies. Company A spends significantly more on research and development and on advertising than Company B. Expenditures on research and development likely result in products with superior technology. Expenditures on advertising likely result in greater brand awareness. So, based on these differences, it is likely that Company A is selling technologically superior products with a better brand image. Company B may be selling its products more cheaply (with a lower gross profit as a percentage of sales) but is saving money by not investing in research and development or advertising. In practice, differences across companies are more subtle, but the concept is similar. An analyst, noting significant differences, would do more research and seek to understand the underlying reasons for the differences and their implications for the future performance of the companies.

Exhibit 18: income Statement for Three Hypothetical Companies

Panel A: Income Statements for Companies A, B, and C (US dollars)

	A	B	C
Sales	USD10,000,000	USD10,000,000	USD2,000,000
Cost of sales	3,000,000	7,500,000	600,000
Gross profit	7,000,000	2,500,000	1,400,000
Selling, general, and administrative expenses	1,000,000	1,000,000	200,000
Research and development	2,000,000	—	400,000

Panel A: Income Statements for Companies A, B, and C (US dollars)

	A	B	C
Advertising	2,000,000	—	400,000
Operating profit	2,000,000	1,500,000	400,000

Panel B: Common-Size Income Statements for Companies A, B, and C (%)

	A	B	C
Sales	100%	100%	100%
Cost of sales	30	75	30
Gross profit	70	25	70
Selling, general, and administrative expenses	10	10	10
Research and development	20	0	20
Advertising	20	0	20
Operating profit	20	15	20

Note: Each line item is expressed as a percentage of the company's sales.

For most expenses, comparison to the amount of sales is appropriate. In the case of taxes, however, it is more meaningful to compare the amount of taxes with the amount of pretax income. Using note disclosure, an analyst can then examine the causes for differences in effective tax rates. To project the companies' future net income, an analyst would project the companies' pretax income and apply an estimated effective tax rate determined in part by the historical tax rates.

Vertical common-size analysis of the income statement is particularly useful in cross-sectional analysis—comparing companies with each other for a particular time period or comparing a company with industry or sector data. The analyst could select individual peer companies for comparison, use industry data from published sources, or compile data from databases based on a selection of peer companies or broader industry data. For example, Exhibit 19 presents median common-size income statement data compiled for the components of the S&P 500 classified into the 10 S&P/ MSCI Global Industrial Classification System (GICS) sectors using 2017 data. Note that when compiling aggregate data such as this, some level of aggregation is necessary and less detail may be available than from peer company financial statements. The performance of an individual company can be compared with industry or peer company data to evaluate its relative performance.

Exhibit 19: Median Common-Size Income Statement Statistics for the S&P 500 Classified by S&P/MSCI GICS Sector Data for 2017

	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care
Number of observations	34	27	69	81	34	59
Gross Margin	37.7%	33.0%	36.8%	37.6%	43.4%	59.0%

	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care
Operating Margin	6.4%	14.9%	13.5%	11.0%	17.2%	17.4%
Net Profit Margin	4.9%	9.9%	8.8%	6.0%	10.9%	7.2%

	Financials	Information Technology	Telecom-munication Services	Utilities	Real Estate
Number of observations	63	64	4	29	29
Gross Margin	40.5%	62.4%	56.4%	34.3%	39.8%
Operating Margin	36.5%	21.1%	15.4%	21.7%	30.1%
Net Profit Margin	18.5%	11.3%	13.1%	10.1%	21.3%

Source: Based on data from Compustat. Operating margin based on EBIT (earnings before interest and taxes).

Income Statement Ratios

One aspect of financial performance is profitability. One indicator of profitability is **net profit margin**, also known as **profit margin** and **return on sales**, which is calculated as net income divided by revenue (or sales):

$$\text{Net profit margin} = \frac{\text{Net income}}{\text{Revenue}}.$$

Net profit margin measures the amount of income that a company was able to generate for each dollar of revenue. A higher level of net profit margin indicates higher profitability and is thus more desirable. Net profit margin can also be found directly on the common-size income statements.

For AB InBev, net profit margin based on continuing operations for 2017 was 16.2 percent (calculated as profit from continuing operations of USD9,155 million, divided by revenue of USD56,444 million). To judge this ratio, some comparison is needed. AB InBev's profitability can be compared with that of another company or with its own previous performance. Compared with previous years, AB InBev's profitability is higher than in 2016 but lower than 2015. In 2016, net profit margin based on continuing operations was 6.0 percent, and in 2015, it was 22.9 percent.

Another measure of profitability is the gross profit margin. Gross profit (gross margin) is calculated as revenue minus cost of goods sold, and the **gross profit margin** is calculated as the gross profit divided by revenue:

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Revenue}}.$$

The gross profit margin measures the amount of gross profit that a company has generated for each dollar of revenue. A higher level of gross profit margin indicates higher profitability and thus is generally more desirable, although differences in gross profit margins across companies reflect differences in companies' strategies. For example, consider a company pursuing a strategy of selling a differentiated product (e.g., a product differentiated based on brand name, quality, superior technology, or patent protection). The company would likely be able to sell the differentiated product at a higher price than a similar, but undifferentiated, product and, therefore, would likely show a higher gross profit margin than a company selling an undifferentiated product. Although a company selling a differentiated product would likely show a higher gross

profit margin, this may take time. In the initial stage of the strategy, the company would likely incur costs to create a differentiated product, such as advertising or research and development, which would not be reflected in the gross margin calculation.

AB InBev's gross profit was USD35,058 million in 2017, USD27,715 million in 2016, and USD26,467 million in 2015. Expressing gross profit as a percentage of revenues, we see that the gross profit margin was 62.1 percent in 2017, 60.9 percent in 2016, and 60.7 percent in 2015. In absolute terms, AB InBev's gross profit was higher in 2016 than in 2015. However, AB InBev's gross profit *margin* was approximately constant between 2015 and 2016.

Exhibit 20 presents a common-size income statement for AB InBev and highlights certain profitability ratios. The net profit margin and gross profit margin described previously are just two of the many subtotals that can be generated from common-size income statements. Other "margins" used by analysts include the **operating profit margin** (profit from operations divided by revenue) and the **pretax margin** (profit before tax divided by revenue).

Exhibit 20: AB InBev's Margins: Abbreviated Common-Size Income Statement

	12 Months Ended 31 December					
	2017		2016		2015	
	US dollars	%	US dollars	%	US dollars	%
Revenue	56,444	100.0	45,517	100.0	43,604	100.0
Cost of sales	(21,386)	(37.9)	(17,803)	(39.1)	(17,137)	(39.3)
Gross profit	35,058	62.1	27,715	60.9	26,467	60.7
Distribution expenses	(5,876)	(10.4)	(4,543)	(10.0)	(4,259)	(9.8)
Sales and marketing expenses	(8,382)	(14.9)	(7,745)	(17.0)	(6,913)	(15.9)
Administrative expenses	(3,841)	(6.8)	(2,883)	(6.3)	(2,560)	(5.9)
<i>Portions omitted</i>						
Profit from operations	17,152	30.4	12,882	28.3	13,904	31.9
Finance cost	(6,885)	(12.2)	(9,382)	(20.6)	(3,142)	(7.2)
Finance income	378	0.7	818	1.8	1,689	3.9
Net finance income/(cost)	(6,507)	(11.5)	(8,564)	(18.8)	(1,453)	(3.3)
Share of result of associates and joint ventures	430	0.8	16	0.0	10	0.0
Profit before tax	11,076	19.6	4,334	9.5	12,461	28.6
Income tax expense	(1,920)	(3.4)	(1,613)	(3.5)	(2,594)	(5.9)
Profit from continuing operations	9,155	16.2	2,721	6.0	9,867	22.6
Profit from discontinued operations	28	0.0	48	0.1	—	—
Profit of the year	9,183	16.3	2,769	6.1	9,867	22.6

Note: reported total amounts may have slight discrepancies due to rounding

The profitability ratios and the common-size income statement yield quick insights about changes in a company's performance. For example, AB InBev's decrease in profitability in 2016 was not driven by a decrease in gross profit margin. Gross profit margin in 2016 was actually slightly higher than in 2015. The company's decrease in profitability in 2016 was driven in part by higher operating expenses and, in particular, by a significant increase in finance costs. The increased finance costs resulted from the 2016 merger with SABMiller. Valued at more than USD100 billion, the acquisition

was one of the largest in history. The combination of AB InBev and SABMiller also explains the increase in revenue from around USD45 billion to over USD56 billion. The profitability ratios and the common-size income statement thus highlight areas about which an analyst might wish to gain further understanding.

PRACTICE PROBLEMS

1. Under IFRS, income includes increases in economic benefits from:
 - A. increases in liabilities not related to owners' contributions.
 - B. enhancements of assets not related to owners' contributions.
 - C. increases in owners' equity related to owners' contributions.
2. Fairplay reported the information shown in Exhibit 1 related to the sale of its products during 2009, which was its first year of business:

Exhibit 1: Fairplay

Revenue	USD1,000,000
Returns of goods sold	USD100,000
Cash collected	USD800,000
Cost of goods sold	USD700,000

Under the accrual basis of accounting, how much net revenue would be reported on Fairplay's 2009 income statement?

- A. USD200,000
 - B. USD900,000
 - C. USD1,000,000
3. Apex Consignment sells items over the internet for individuals on a consignment basis. Apex receives the items from the owner, lists them for sale on the internet, and receives a 25 percent commission for any items sold. Apex collects the full amount from the buyer and pays the net amount after commission to the owner. Unsold items are returned to the owner after 90 days. During 2009, Apex had the following information:
 - Total sales price of items sold during 2009 on consignment was EUR2,000,000.
 - Total commissions retained by Apex during 2009 for these items was EUR500,000.

How much revenue should Apex report on its 2009 income statement?

 - A. EUR500,000
 - B. EUR2,000,000
 - C. EUR1,500,000
4. A company previously expensed the incremental costs of obtaining a contract. All else being equal, adopting the May 2014 IASB and FASB converged accounting standards on revenue recognition makes the company's profitability initially appear:
 - A. lower.

- B. unchanged.
 - C. higher.
5. Under IFRS, a loss from the destruction of property in a fire would most likely be classified as:
- A. continuing operations.
 - B. discontinued operations.
 - C. other comprehensive income.
6. A company chooses to change an accounting policy. This change requires that, if practical, the company restate its financial statements for:
- A. all prior periods.
 - B. current and future periods.
 - C. prior periods shown in a report.
7. For 2009, Flamingo Products had net income of USD1,000,000. At 1 January 2009, there were 1,000,000 shares outstanding. On 1 July 2009, the company issued 100,000 new shares for USD20 per share. The company paid USD200,000 in dividends to common shareholders. What is Flamingo's basic earnings per share for 2009?
- A. USD0.80
 - B. USD0.91
 - C. USD0.95
8. A company with no debt or convertible securities issued publicly traded common stock three times during the current fiscal year. Under both IFRS and US GAAP, the company's:
- A. basic EPS equals its diluted EPS.
 - B. capital structure is considered complex at year-end.
 - C. basic EPS is calculated by using a simple average number of shares outstanding.
9. For its fiscal year-end, Sublyme Corporation reported net income of USD200 million and a weighted average of 50,000,000 common shares outstanding. There are 2,000,000 convertible preferred shares outstanding that paid an annual dividend of USD5. Each preferred share is convertible into two shares of the common stock. The diluted EPS is *closest to*:
- A. USD3.52
 - B. USD3.65
 - C. USD3.70
10. For its fiscal year-end, Calvin Water Corporation (CWC) reported net income of USD12 million and a weighted average of 2,000,000 common shares outstanding. The company paid USD800,000 in preferred dividends and had 100,000 options

outstanding with an average exercise price of USD20. CWC's market price over the year averaged USD25 per share. CWC's diluted EPS is *closest* to:

- A. USD5.33
- B. USD5.54
- C. USD5.94

11. Laurelli Builders (LB) reported the financial data shown in Exhibit 1 for year-end 31 December:

Exhibit 1: Laurelli Builders

Common shares outstanding, 1 January	2,020,000
Common shares issued as stock dividend, 1 June	380,000
Warrants outstanding, 1 January	500,000
Net income	USD3,350,000
Preferred stock dividends paid	USD430,000
Common stock dividends paid	USD240,000

Which statement about the calculation of LB's EPS is *most* accurate?

- A. LB's basic EPS is USD1.12.
 - B. LB's diluted EPS is equal to or less than its basic EPS.
 - C. The weighted average number of shares outstanding is 2,210,000.
12. Cell Services Inc. (CSI) had 1,000,000 average shares outstanding during all of 2009. During 2009, CSI also had 10,000 options outstanding with exercise prices of USD10 each. The average stock price of CSI during 2009 was USD15. For purposes of computing diluted earnings per share, how many shares would be used in the denominator?
- A. 1,003,333
 - B. 1,006,667
 - C. 1,010,000
13. When calculating diluted EPS, which of the following securities in the capital structure increases the weighted average number of common shares outstanding without affecting net income available to common shareholders?
- A. Stock options
 - B. Convertible debt that is dilutive
 - C. Convertible preferred stock that is dilutive
14. Which statement is *most* accurate? A common size income statement:
- A. restates each line item of the income statement as a percentage of net income.

- B.** allows an analyst to conduct cross-sectional analysis by removing the effect of company size.
- C.** standardizes each line item of the income statement but fails to help an analyst identify differences in companies' strategies.

SOLUTIONS

1. B is correct. Under IFRS, income includes increases in economic benefits from increases in assets, enhancement of assets, and decreases in liabilities.
2. B is correct. Net revenue is revenue for goods sold during the period less any returns and allowances, or USD1,000,000 minus USD100,000 = USD900,000.
3. A is correct. Apex is not the owner of the goods and should only report its net commission as revenue.
4. C is correct. Under the converged accounting standards, the incremental costs of obtaining a contract and certain costs incurred to fulfill a contract must be capitalized. If a company expensed these incremental costs in the years prior to adopting the converged standards, all else being equal, its profitability will appear higher under the converged standards.
5. A is correct. A fire may be infrequent, but it would still be part of continuing operations and reported in the profit and loss statement. Discontinued operations relate to a decision to dispose of an operating division.
6. C is correct. If a company changes an accounting policy, the financial statements for all fiscal years shown in a company's financial report are presented, if practical, as if the newly adopted accounting policy had been used throughout the entire period; this retrospective application of the change makes the financial results of any prior years included in the report comparable. Notes to the financial statements describe the change and explain the justification for the change.
7. C is correct. The weighted average number of shares outstanding for 2009 is 1,050,000. Basic earnings per share would be USD1,000,000 divided by 1,050,000, or USD0.95.
8. A is correct. Basic and diluted EPS are equal for a company with a simple capital structure. A company that issues only common stock, with no financial instruments that are potentially convertible into common stock has a simple capital structure. Basic EPS is calculated using the weighted average number of shares outstanding.

9. C is correct.

Diluted EPS

$$= (\text{Net income}) / (\text{Weighted average number of shares outstanding} + \text{New common shares that would have been issued at conversion})$$

$$= \text{USD}200,000,000 / [50,000,000 + (2,000,000 \times 2)]$$

$$= \text{USD}3.70$$

The diluted EPS assumes that the preferred dividend is not paid and that the shares are converted at the beginning of the period.

10. B is correct. The formula to calculate diluted EPS is as follows:

Diluted EPS

$$= (\text{Net income} - \text{Preferred dividends}) / [\text{Weighted average number of shares outstanding} + (\text{New shares that would have been issued at option exercise} - \text{Shares that could have been purchased with cash received upon exercise}) \times (\text{Proportion of year during which the financial instruments were outstanding})]$$

The underlying assumption is that outstanding options are exercised, and then the proceeds from the issuance of new shares are used to repurchase shares already outstanding:

Proceeds from option exercise = $100,000 \times \text{USD}20 = \text{USD}2,000,000$

Shares repurchased = $\text{USD}2,000,000 / \text{USD}25 = 80,000$

The net increase in shares outstanding is thus $100,000 - 80,000 = 20,000$. Therefore, the diluted EPS for CWC = $(\text{USD}12,000,000 - \text{USD}800,000) / 2,020,000 = \text{USD}5.54$.

11. B is correct. LB has warrants in its capital structure; if the exercise price is less than the weighted average market price during the year, the effect of their conversion is to increase the weighted average number of common shares outstanding, causing diluted EPS to be lower than basic EPS. If the exercise price is equal to the weighted average market price, the number of shares issued equals the number of shares repurchased. Therefore, the weighted average number of common shares outstanding is not affected and diluted EPS equals basic EPS. If the exercise price is greater than the weighted average market price, the effect of their conversion is anti-dilutive. As such, they are not included in the calculation of basic EPS. LB's basic EPS is $\text{USD}1.22 [= (\text{USD}3,350,000 - \text{USD}430,000) / 2,400,000]$. Stock dividends are treated as having been issued retroactively to the beginning of the period.

12. A is correct. With stock options, the treasury stock method must be used. Under that method, the company would receive $\text{USD}100,000 (10,000 \times \text{USD}10)$ and would repurchase 6,667 shares ($\text{USD}100,000 / \text{USD}15$). The shares for the denominator would be:

Shares outstanding	1,000,000
Options exercises	10,000
Treasury shares purchased	(6,667)
Denominator	1,003,333

13. A is correct. When a company has stock options outstanding, diluted EPS is calculated as if the financial instruments had been exercised and the company had used the proceeds from the exercise to repurchase as many shares possible at the weighted average market price of common stock during the period. As a result, the conversion of stock options increases the number of common shares outstanding but has no effect on net income available to common shareholders. The conversion of convertible debt increases the net income available to common shareholders by the after-tax amount of interest expense saved. The conversion of convertible preferred shares increases the net income available to common shareholders by the amount of preferred dividends paid; the numerator becomes the net income.
14. B is correct. Common size income statements facilitate comparison across time periods (time-series analysis) and across companies (cross-sectional analysis) by stating each line item of the income statement as a percentage of revenue. The relative performance of different companies can be more easily assessed because

scaling the numbers removes the effect of size. A common size income statement states each line item on the income statement as a percentage of revenue. The standardization of each line item makes a common size income statement useful for identifying differences in companies' strategies.

LEARNING MODULE

3

Analyzing Balance Sheets

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	explain the financial reporting and disclosures related to intangible assets
☐	explain the financial reporting and disclosures related to goodwill
☐	explain the financial reporting and disclosures related to financial instruments
☐	explain the financial reporting and disclosures related to non-current liabilities
☐	calculate and interpret common-size balance sheets and related financial ratios

INTRODUCTION

1

The balance sheet discloses what an entity owns (assets), what an entity owes (liabilities), and the owners' interest in the net assets of a company (equity) at a specific point in time. While many balance sheet items are reported at historical cost, some items are measured differently, such as at fair value, and some events and transactions—perhaps contrary to analyst's expectations—are not recognized at all. Analysts must be familiar with the different rules and practices for recognition, measurement, and disclosure of balance sheet items to evaluate the liquidity, solvency, and overall financial position of companies. To do so, analysts often compute ratios involving the balance sheet and other financial statements, such as the ratio of debt to operating income or cash flows, which can be compared to other companies and over time.

LEARNING MODULE OVERVIEW



- Some assets and liabilities are measured at fair value and some are measured at amortized or historical cost. Notes to the financial statements provide information that is helpful in assessing the comparability of measurement bases across companies.

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

- Intangible assets refer to identifiable non-monetary assets without physical substance. Examples include patents, licenses, and trademarks. For each intangible asset, a company assesses whether its useful life is finite or indefinite.
- An intangible asset with a finite useful life is amortized on a systematic basis over the best estimate of its useful life, with the amortization method and useful life estimate reviewed at least annually. Intangibles are subject to impairment as well, in a similar manner to tangible assets like property, plant, and equipment.
- An intangible asset with an indefinite useful life is not amortized. Instead, it is tested for impairment at least annually.
- For internally generated intangible assets, the International Financial Reporting Standards (IFRS) require that costs incurred during the research phase must be expensed. Costs incurred in the development stage can be capitalized as intangible assets if certain criteria are met, including technological feasibility, the ability to use or sell the resulting asset, and the ability to complete the project.
- The most common intangible asset that is not a separately identifiable asset is goodwill, which arises in business combinations. Goodwill is not amortized; instead it is tested for impairment at least annually.
- Financial instruments are contracts that give rise to both a financial asset of one entity and a financial liability or equity instrument of another entity. In general, financial instruments are measured in two ways: fair value or amortized cost. For financial instruments measured at fair value, the two basic alternatives in how net changes in fair value are recognized are (1) as profit or loss on the income statement, or (2) as other comprehensive income (loss) that bypasses the income statement.
- Common long-term liabilities include loans (i.e., borrowings from banks), notes or bonds payable (i.e., fixed-income securities issued to investors), leases, and post-employment liabilities. Liabilities are usually reported at amortized cost or fair value on the balance sheet.
- Vertical common-size analysis of the balance sheet involves expressing each balance sheet item as a percentage of total assets.
- Balance sheet ratios include liquidity ratios (measuring the company's ability to meet its short-term obligations) and solvency ratios (measuring the company's ability to meet long-term and other obligations).

2

INTANGIBLE ASSETS



explain the financial reporting and disclosures related to intangible assets

Intangible assets are identifiable non-monetary assets without physical substance.¹ An identifiable asset can be acquired on a standalone basis (i.e., can be separated from the entity) or arises from contractual or legal rights and privileges. Common examples include patents, licenses, trademarks, and customer lists. The most common intangible that is *not* separately identifiable is goodwill, which arises in business combinations and is discussed further in the next lesson.

IFRS permits companies to report intangible assets using either a cost model or a revaluation model. The revaluation model can be selected only when there is an active market for an intangible asset. Both measurement models are essentially the same as described for property, plant, and equipment (PP&E). US GAAP permits only the cost model.

For each intangible asset, a company assesses whether the useful life of the asset is finite or indefinite. Amortization and impairment principles apply as follows:

- An intangible asset with a finite useful life is amortized on a systematic basis over the best estimate of its useful life, with the amortization method and useful life estimate reviewed at least annually.
- Impairment principles for an intangible asset with a finite useful life are the same as for PP&E.
- An intangible asset with an indefinite useful life is not amortized. Instead, at least annually, the reasonableness of assuming an indefinite useful life for the asset is reviewed and the asset is tested for impairment.

Financial analysts traditionally view reported values of intangible assets - particularly goodwill - with caution. Consequently, in assessing financial statements, some analysts exclude the book value assigned to intangibles, reducing net equity by an equal amount (obtaining a “tangible book value”) and increasing pretax income by any amortization expense or impairment associated with the intangibles. An arbitrary assignment of zero value to intangibles is not advisable; instead, an analyst should examine each listed intangible and assess whether an adjustment should be made. Note disclosures about intangible assets may provide useful information to the analyst. These disclosures include information about useful lives, amortization rates and methods, and impairment losses recognized or reversed.

Further, a company may have developed intangible assets internally that can be recognized only in certain circumstances. Companies may also have assets that are never recorded on a balance sheet because they are non-identifiable and the company does not have sufficient control over their future economic benefits. These assets might include management and technical skills of employees, market share, name recognition, a good reputation among customers, and so forth. Such assets are valuable and are reflected, in theory, in the price at which the company’s equity securities trade in the market (and the price at which the entirety of the company’s equity would be sold in an acquisition transaction). Such assets may be recognized as goodwill by an acquirer if the company is sold.

Identifiable Intangibles

Under IFRS, identifiable intangible assets are recognized on the balance sheet if it is probable that future economic benefits will flow to the company and the cost of the asset can be measured reliably. Examples of identifiable intangible assets include patents, trademarks, copyrights, franchises, licenses, and other rights. Identifiable intangible assets may have been created internally or purchased by a company. Determining the

¹ International Accounting Standard 38, *Intangible Assets*, paragraph 8.

cost of internally created intangible assets can be difficult and subjective. For these reasons, under IFRS and US GAAP, the general requirement is that internally created identifiable intangibles are expensed rather than reported on the balance sheet.

IFRS provides that for internally created intangible assets, the company must separately identify its research phase and development phase.² The research phase includes activities that seek new knowledge or products. The development phase occurs after the research phase and includes design or testing of prototypes and models. IFRS requires that costs to internally generate intangible assets during the research phase must be expensed on the income statement while costs incurred in the development stage can be capitalized as intangible assets if certain criteria are met, including technological feasibility, the ability to use or sell the resulting asset, and the ability to complete the project.

US GAAP prohibits the capitalization of most costs of internally developed intangibles and research and development. All such costs are expensed. Costs related to the following categories typically are expensed under IFRS and US GAAP. They include the following:

- internally generated brands, mastheads, publishing titles, and customer lists;
- start-up costs;
- training costs;
- administrative and other general overhead costs;
- advertising and promotion;
- relocation and reorganization expenses; and
- redundancy and other termination costs.

In contrast to internally created intangibles, *acquired* or *purchased* intangible assets are capitalized and reported as separately identifiable intangible, so long as they arise from contractual rights (such as a licensing agreement), other legal rights (such as patents), or have the ability to be separated and sold (such as a customer list).

MEASURING INTANGIBLE ASSETS



Alpha Inc., a motor vehicle manufacturer, has a research division that worked on the following projects during the year:

- Project 1 Research aimed at finding a steering mechanism that does not operate like a conventional steering wheel but reacts to the impulses from a driver's fingers.
- Project 2 The design of a prototype welding apparatus that is controlled electronically rather than mechanically. The apparatus has been determined to be technologically feasible, salable, and feasible to produce.

The following is a summary of the expenses of the research division (in thousands of euros):

² International Accounting Standard 38, *Intangible Assets*, paragraphs 51–67.

Exhibit 1: Summary of Expenses

	General	Project 1	Project 2
Material and services	128	935	620
Labor			
▪ Direct labor	—	630	320
▪ Administrative personnel	720	—	—
Design, construction, and testing	270	450	470

1. Five percent of administrative personnel costs can be attributed to each project (Project 1 and 2). Explain the accounting treatment of Alpha's costs for Projects 1 and 2 under IFRS and US GAAP.

Solution to 1:

Under IFRS, the capitalization of internal development costs for Projects 1 and 2 would be as follows:

	Amount Capitalized as an Asset (in thousands of euros)
Project 1: Classified as in the research stage, so all costs are recognized as expenses	0
Project 2: Classified as in the development stage, so costs may be capitalized. Note that administrative costs are not capitalized.	$(620 + 320 + 470) = 1,410$

Under US GAAP, there would no capitalization of these costs as US GAAP prohibits the capitalization of most costs of internally developed intangibles and research and development. All costs would be expensed.

Consider the balance sheet information presented in Exhibit 2 and 3 for SAP and Apple. SAP's 2017 balance sheet shows EUR2,967 million of intangible assets, and Apple's 2017 balance sheet shows acquired intangible assets, net of USD2,298 million. SAP's notes to financial statements disclose the types of intangible assets (software and database licenses, purchased software to be incorporated into its products, customer contracts, and acquired trademark licenses) and indicates that all of its purchased intangible assets other than goodwill have finite useful lives and are amortized either based on expected consumption of economic benefits or on a straight-line basis over their estimated useful lives, which range from 2 to 20 years. Apple's notes disclose that its acquired intangible assets consist primarily of patents and licenses, and almost the entire amount represents definite-lived and amortizable assets for which the remaining weighted-average amortization period is 3.4 years as of 2017.

Exhibit 2: SAP Group Consolidated Statements of Financial Position (Excerpt: Non-Current Assets Detail) (in millions of EUR)

	As of 31 December	
Assets	2017	2016
Total current assets	11,930	11,564
Goodwill	21,274	23,311
Intangible assets	2,967	3,786
Property, plant and equipment	2,967	2,580
Other financial assets	1,155	1,358
Trade and other receivables	118	126
Other non-financial assets	621	532
Tax assets	443	450
Deferred tax assets	1,022	571
Total non-current assets	30,567	32,713
Total assets	42,497	44,277
Total current liabilities	10,210	9,674
Total non-current liabilities	6,747	8,205
Total liabilities	16,958	17,880
Total equity	25,540	26,397
Total equity and liabilities	€42,497	€44,277

Source: SAP Group 2017 annual report.

Exhibit 3: Apple, Inc. Consolidated Balance Sheets (Excerpt: Non-Current Assets Detail) (in millions of US dollars)

Assets	30 September 2017	24 September 2016
Total current assets	128,645	106,869
Long-term marketable securities	194,714	170,430
Property, plant and equipment, net	33,783	27,010
Goodwill	5,717	5,414
Acquired intangible assets, net	2,298	3,206
Other non-current assets	10,162	8,757
<i>[All other assets]</i>	<i>246,674</i>	<i>214,817</i>
Total assets	375,319	321,686
Liabilities and shareholders' equity		
Total current liabilities	100,814	79,006
<i>[Total non-current liabilities]</i>	<i>140,458</i>	<i>114,431</i>
Total liabilities	241,272	193,437
Total shareholders' equity	134,047	128,249
Total liabilities and shareholders' equity	375,319	321,686

Note: The italicized subtotals presented in this excerpt are not explicitly shown on the face of the

financial statement as prepared by the company.
Source: Apple Inc. 2017 annual report (Form 10K).

GOODWILL

3

- ☐ explain the financial reporting and disclosures related to goodwill

When one company acquires another, the purchase price is allocated to all of the identifiable assets (tangible and intangible) and liabilities acquired, based on fair value. If the purchase price is greater than the fair value of the identifiable assets and liabilities acquired, the excess amount is recognized as an asset, **goodwill**. To understand why an acquirer would pay more to purchase a company than the fair value of the target company's identifiable assets net of liabilities, consider the following three observations. First, certain items not recognized in the acquiree's financial statements (e.g., its reputation, established distribution system, trained employees) have value. Second, a target company's expenditures in research and development may not have resulted in a separately identifiable asset that meets the criteria for recognition but nonetheless may have created some value. Third, part of the value of an acquisition may arise from improved strategic positioning versus a competitor or from perceived synergies such as operating cost saving opportunities after the acquisition.

The subject of recognizing goodwill in financial statements has both proponents and opponents. The proponents of goodwill recognition assert that goodwill is the present value of excess returns that a company is expected to earn. This group claims that determining the present value of these excess returns is analogous to determining the present value of future cash flows associated with other assets and projects. Opponents of goodwill recognition claim that the prices paid for acquisitions often turn out to be based on unrealistic expectations, thereby leading to future write-offs of goodwill.

Analysts should distinguish between accounting goodwill and economic goodwill. Economic goodwill is based on the economic performance of the entity, whereas accounting goodwill is based on accounting standards and is reported only in the case of acquisitions. Economic goodwill is important to analysts and investors, and it is not necessarily reflected on the balance sheet. Instead, economic goodwill is reflected in the stock price (at least in theory). Some financial statement users believe that goodwill should not be listed on the balance sheet, because it cannot be sold separately from the entity. These financial statement users believe that only assets that can be separately identified and sold should be reflected on the balance sheet. Other financial statement users analyze goodwill and any subsequent impairment charges to assess management's performance on prior acquisitions.

Under both IFRS and US GAAP, accounting goodwill arising from acquisitions is capitalized. Goodwill is not amortized but is tested for impairment annually. If goodwill is deemed to be impaired, an impairment loss is charged against income in the current period, reducing earnings. An impairment loss also reduces total assets, so some performance measures, such as return on assets (net income divided by average total assets), may increase in future periods. An impairment loss is a non-cash item.

Accounting standards' requirements for recognizing goodwill can be summarized by the following steps:

- Step 1 The total cost to purchase the target company (the acquiree) is determined.

- Step 2 The acquiree's identifiable assets are measured at fair value. The acquiree's liabilities and contingent liabilities are measured at fair value. The difference between the fair value of identifiable assets and the fair value of the liabilities and contingent liabilities equals the net identifiable assets acquired.
- Step 3 Goodwill arising from the purchase is the excess of (1) the cost to purchase the target company over (2) the net identifiable assets acquired. Occasionally, a transaction will involve the purchase of net identifiable assets with a value greater than the cost to purchase. Such a transaction is called a "bargain purchase." Any gain from a bargain purchase is recognized in profit and loss in the period in which it arises.³

Companies are also required to disclose information that enables users to evaluate the nature and financial effect of business combinations. The required disclosures include, for example, the acquisition date fair value of the total cost to purchase the target company, the acquisition date amount recognized for each major class of assets and liabilities, and a qualitative description of the factors that make up the goodwill recognized.

Despite the guidance incorporated in accounting standards, analysts should be aware that the estimations of fair value involve considerable management judgment. Values for intangible assets, such as computer software, might not be easily validated when analyzing acquisitions. Management judgment about valuation in turn affects current and future financial statements because identifiable intangible assets with definite lives are amortized over time. In contrast, neither goodwill nor identifiable intangible assets with indefinite lives are amortized; instead, as noted, both are tested annually for impairment.

The recognition and impairment of goodwill can significantly affect the comparability of financial statements between companies. Therefore, analysts often adjust the companies' financial statements by removing the impact of goodwill. Such adjustments include the following:

- excluding goodwill from balance sheet data used to compute financial ratios, and
- excluding goodwill impairment losses from income data used to examine operating trends.

In addition, analysts can develop expectations about a company's performance following an acquisition by taking into account the purchase price paid relative to the net assets and earnings prospects of the acquired company.

GOODWILL IMPAIRMENT



Safeway, Inc., is a North American food and drug retailer. On 25 February 2010, Safeway issued a press release that included the following information:

- Safeway Inc. today reported a net loss of USD1,609.1 million (USD4.06 per diluted share) for the 16-week fourth quarter of 2009. Excluding a non-cash goodwill impairment charge of USD1,818.2 million, net of tax (USD4.59 per diluted share), net income would have been

³ IFRS 3, *Business Combinations* and Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 805, *Business Combinations*.

USD209.1 million (USD0.53 per diluted share). Net income was USD338.0 million (USD0.79 per diluted share) for the 17-week fourth quarter of 2008.

- In the fourth quarter of 2009, Safeway recorded a non-cash goodwill impairment charge of USD1,974.2 million (USD1,818.2 million, net of tax). The impairment was due primarily to Safeway's reduced market capitalization and a weak economy. . . . The goodwill originated from previous acquisitions.
- Safeway's balance sheet as of 2 January 2010 showed goodwill of USD426.6 million and total assets of USD14,963.6 million. The company's balance sheet as of 3 January 2009 showed goodwill of USD2,390.2 million and total assets of USD17,484.7 million.

1. How significant was this goodwill impairment charge?

Solution:

The goodwill impairment was more than 80 percent of the total value of goodwill and 11 percent of total assets, so it was clearly significant. (The charge of USD1,974.2 million equals 82.6 percent of the USD2,390.2 million of goodwill at the beginning of the year and 11.3 percent of the USD17,484.7 million total assets at the beginning of the year.)

2. With reference to acquisition prices, what might this goodwill impairment indicate?

Solution:

The goodwill had originated from previous acquisitions. The impairment charge implies that the acquired operations are now worth less than the price that was paid for their acquisition.

As presented in Exhibits 2 and 3, SAP's 2017 balance sheet shows EUR21,274 million of goodwill, and Apple's 2017 balance sheet shows goodwill of USD5,717 million. Goodwill represents 50.1 percent of SAP's total assets and only 1.5 percent of Apple's total assets. An analyst may be concerned that goodwill represents such a high proportion of SAP's total assets.

FINANCIAL INSTRUMENTS

4



explain the financial reporting and disclosures related to financial instruments

IFRS defines a financial instrument as a contract that gives rise to a financial asset of one entity, and a financial liability or equity instrument of another entity.⁴ This lesson focuses on financial assets, such as a company's investments in stocks issued by another company or its investments in the notes, bonds, or other fixed-income instruments issued by another company (or issued by a governmental entity). Financial liabilities, such as notes payable and bonds payable issued by the company, will be discussed later. Some financial instruments may be classified as either an asset or a liability

⁴ IAS 32, *Financial Instruments: Presentation*, paragraph 11.

depending on the contractual terms and current market conditions. One example of such a financial instrument is a derivative. **Derivatives** are financial instruments for which the value is derived based on some underlying factor (interest rate, exchange rate, commodity price, security price, or credit rating) and for which little or no initial investment is required.

Financial instruments are generally recognized when the entity becomes a party to the contractual provisions of the instrument. In general, the two basic alternative ways that financial instruments are measured subsequent to initial acquisition are fair value or amortized cost. Recall that fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly market transaction.⁵ The amortized cost of a financial asset (or liability) is the amount at which it was initially recognized, minus any principal repayments, plus or minus any amortization of discount or premium, and minus any reduction for impairment.

Under IFRS, financial assets are subsequently measured at amortized cost if the asset's cash flows occur on specified dates and consist solely of principal and interest, and if the business model is to hold the asset to maturity. The concept is similar in US GAAP, where this category of asset is referred to as **held-to-maturity**. An example is an investment in a long-term bond issued by another company or by a government; the value of the bond will fluctuate, for example with interest rate movements, but if the bond is classified as a held-to-maturity investment, it will be measured at amortized cost on the balance sheet of the investing company. Other types of financial assets measured at amortized cost are loans to other companies.

For financial instruments measured at fair value, the two basic alternatives in how net changes in fair value are recognized are (1) as profit or loss on the income statement, or (2) as other comprehensive income (loss), which bypasses the income statement. Note that these alternatives refer to *unrealized* changes in fair value, that is, changes in the value of a financial asset that has not been sold and is still owned at the end of the period. Unrealized gains and losses also are referred to as holding period gains and losses. *Realized* gains or losses as a result of a sale are reported on the income statement.

Under IFRS, financial assets are subsequently measured at fair value through other comprehensive income (i.e., any unrealized holding gains or losses are recognized in other comprehensive income) if the business model's objective involves both collecting contractual cash flows and selling the financial assets. This IFRS category applies specifically to debt investments, namely assets with cash flows occurring on specified dates and consisting solely of principal and interest. However, IFRS also permits equity investments to be measured at fair value through other comprehensive income if, at the time a company buys an equity investment, the company decides to make an irrevocable election to measure the asset in this manner.⁶ The concept is similar to the US GAAP investment category **available-for-sale** in which assets are measured at fair value, with any unrealized holding gains or losses recognized in other comprehensive income. Unlike IFRS, however, the US GAAP category available-for-sale applies only to debt securities and is not permitted for investments in equity securities.⁷

Under IFRS, financial assets are subsequently measured at fair value through profit or loss (i.e., any unrealized holding gains or losses are recognized in the income statement) if they are not assigned to either of the other two measurement categories described earlier. In addition, IFRS allows a company to make an irrevocable election at acquisition to measure a financial asset in this category. Under US GAAP, all investments in equity securities (other than investments giving rise to ownership

⁵ IFRS 13, *Fair Value Measurement*; and US GAAP ASC 820, *Fair Value Measurement*.

⁶ IFRS 7, *Financial Instruments: Disclosures*, paragraph 8(h); and IFRS 9 *Financial Instruments*, paragraph 5.7.5.

⁷ US GAAP, Accounting Standards Update (ASU) 2016-01, *Recognition and Measurement of Financial Assets and Financial Liabilities*; and US GAAP, ASC 32X, *Investments*.

positions that confer significant influence over the investee) are measured at fair value with unrealized holding gains or losses recognized in the income statement. Under US GAAP, debt securities designated as trading securities are also measured at fair value with unrealized holding gains or losses recognized in the income statement. The trading securities category pertains to a debt security that is acquired with the intent of selling it rather than holding it to collect the interest and principal payments.

Exhibit 4 summarizes how various financial assets are classified and measured subsequent to acquisition.

Exhibit 4: Measurement of Financial Assets

Measured at Cost or Amortized Cost	Measured at Fair Value through Other Comprehensive Income	Measured at Fair Value through Profit and Loss
▪ Debt securities that are to be held to maturity. ▪ Loans and notes receivable ▪ Unquoted equity instruments (in limited circumstances in which the fair value is not reliably measurable, cost may serve as a proxy [estimate] for fair value)	▪ “Available-for-sale” debt securities (US GAAP); debt securities for which the business model involves both collecting interest and principal and selling the security (IFRS) ▪ Equity investments for which the company irrevocably elects this measurement at acquisition (IFRS only)	▪ All equity securities unless the investment gives the investor significant influence (US GAAP only) ▪ “Trading” debt securities (US GAAP) ▪ Securities not assigned to either of the other two categories, or investments for which the company irrevocably elects this measurement at acquisition (IFRS only)

To illustrate the different accounting treatments of the gains and losses on financial assets, consider an entity that invests EUR100,000,000 on 1 January 202X in a fixed-income security investment, with a 5 percent coupon paid semi-annually. After six months, the company receives the first coupon payment of EUR2,500,000. Additionally, market interest rates have declined such that the value of the fixed-income investment has increased by EUR2,000,000 as of 30 June 202X. Exhibit 5 illustrates how this situation will be portrayed on the balance sheet and income statement (ignoring taxes) of the entity concerned, under each of the following three measurement categories of financial assets: assets held for trading purposes, assets available for sale, and held-to-maturity assets.

Exhibit 5: Accounting for Gains and Losses on Marketable Securities

IFRS Categories	Measured at Cost or Amortized Cost	Measured at Fair Value through Other Comprehensive Income	Measured at Fair Value through Profit and Loss
<i>US GAAP Comparable Categories</i>	<i>Held to Maturity</i>	<i>Available-for-Sale Debt Securities</i>	<i>Trading Debt Securities</i>
Income Statement for period 1 January–30 June 202X			
Interest income	2,500,000	2,500,000	2,500,000
Unrealized gains	—	—	2,000,000
Impact on profit and loss	2,500,000	2,500,000	4,500,000
Balance Sheet as of 30 June 202X			
<i>Assets</i>			
Cash and cash equivalents	2,500,000	2,500,000	2,500,000
Cost of securities	100,000,000	100,000,000	100,000,000

IFRS Categories	Measured at Cost or Amortized Cost	Measured at Fair Value through Other Comprehensive Income	Measured at Fair Value through Profit and Loss
Unrealized gains on securities	—	2,000,000	2,000,000
	102,500,000	104,500,000	104,500,000
<i>Liabilities</i>			
<i>Equity</i>			
Paid-in capital	100,000,000	100,000,000	100,000,000
Retained earnings	2,500,000	2,500,000	4,500,000
Accumulated other comprehensive income	—	2,000,000	—
	102,500,000	104,500,000	104,500,000

In the case of securities classified as Measured at Cost or Amortized Cost, or equivalently held-to-maturity (US GAAP), the income statement shows only the interest income (which is then reflected in retained earnings on the ending balance sheet). Because the securities are measured at cost rather than at fair value, no unrealized gain is recognized. On the balance sheet, the investment asset is shown at its amortized cost of EUR100,000,000.

In the case of securities classified as Measured at Fair Value through Other Comprehensive Income (IFRS), or equivalently as Available-for-Sale debt securities (US GAAP), the income statement shows only the interest income (which is then reflected in retained earnings on the ending balance sheet). The unrealized gain does not appear on the income statement; instead, it would appear on a Statement of Comprehensive Income as Other Comprehensive Income. On the balance sheet, the investment asset is shown at its fair value of EUR102,000,000. (Exhibit 5 shows the unrealized gain on a separate line solely to highlight the impact of the change in value. In practice, the investments would be shown at their fair value on a single line.) In the case of securities classified as Measured at Fair Value through Profit and Loss (IFRS), or equivalently as trading debt securities (US GAAP), both the interest income and the unrealized gain are included on the income statement and thus are reflected in retained earnings on the balance sheet.

From the information presented in Exhibits 2 and 6, SAP's 2017 balance sheet shows other financial assets of EUR990 million (current, Exhibit 6) and EUR1,155 million (non-current, Exhibit 2). The company's notes disclose that the largest component of the current financial assets are loans and other financial receivables (EUR793 million) and the largest component of the non-current financial assets is EUR827 million of available-for-sale equity investments.

Exhibit 6: SAP Group Consolidated Statements of Financial Position (Excerpt: Current Assets Detail) (in millions of euros)

Assets	As of 31 December	
	2017	2016
Cash and cash equivalents	€4,011	€3,702
Other financial assets	990	1,124
Trade and other receivables	5,899	5,924

Assets	As of 31 December	
	2017	2016
Other non-financial assets	725	581
Tax assets	306	233
Total current assets	11,930	11,564
Total non-current assets	30,567	32,713
Total assets	42,497	44,277
Total current liabilities	10,210	9,674
Total non-current liabilities	6,747	8,205
Total liabilities	16,958	17,880
Total equity	25,540	26,397
Total equity and liabilities	€42,497	€44,277

Source: SAP Group 2017 annual report.

Exhibit 7: Apple, Inc. Consolidated Balance Sheets (Excerpt: Current Assets Detail) (in millions of US dollars)

Assets	30 September, 2017	24 September, 2016
Cash and cash equivalents	\$20,289	\$20,484
Short-term marketable securities	53,892	46,671
Accounts receivable, less allowances of \$58 and \$53, respectively	17,874	15,754
Inventories	4,855	2,132
Vendor non-trade receivables	17,799	13,545
Other current assets	13,936	8,283
Total current assets	128,645	106,869
<i>[All other assets]</i>	<i>246,674</i>	<i>214,817</i>
Total assets	375,319	321,686
Total current liabilities	100,814	79,006
<i>[Total non-current liabilities]</i>	<i>140,458</i>	<i>114,431</i>
Total liabilities	241,272	193,437
Total shareholders' equity	134,047	128,249
Total liabilities and shareholders' equity	\$375,319	\$321,686

Note: The italicized subtotals presented in this excerpt are not explicitly shown on the face of the financial statement as prepared by the company.

Source: Apple Inc. 2017 annual report (Form 10K).

In Exhibits 3 and 7, Apple's 2017 balance sheet shows USD53,892 million of short-term marketable securities (current, Exhibit 7) and USD194,714 million of long-term marketable securities (non-current, Exhibit 3). In total, marketable securities represent more than 66 percent of Apple's USD375.3 billion in total assets. Marketable securities plus cash and cash equivalents represent around 72 percent of the company's total assets. Apple's notes disclose that most of the company's marketable securities are fixed-income securities issued by the US government or its agencies (USD60,237 million) and by other companies, including commercial paper (USD153,451 million).

In accordance with its investment policy, Apple invests in highly rated securities (which the company defines as investment grade) and limits its credit exposure to any one issuer. The company classifies its marketable securities as available for sale and reports them on the balance sheet at fair value. Unrealized gains and losses are reported in other comprehensive income.

5

NON-CURRENT LIABILITIES



explain the financial reporting and disclosures related to non-current liabilities

All liabilities that are not classified as current are considered to be non-current or long-term. Exhibit 8 and Exhibit 9 present balance sheet excerpts for SAP Group and Apple Inc. showing the line items for the companies' non-current liabilities.

Both companies' balance sheets show non-current unearned revenue (deferred income for SAP Group and deferred revenue for Apple). These amounts represent unearned revenue relating to goods and services expected to be delivered in periods beyond 12 months following the reporting period. The sections that follow focus on two common types of non-current (long-term) liabilities: long-term financial liabilities and deferred tax liabilities.

Exhibit 8: SAP Group Consolidated Statements of Financial Position (Excerpt: Non-Current Liabilities Detail) (in millions of euros)

	As of 31 December	
	2017	2016
Assets		
Total current assets	11,930	11,564
Total non-current assets	30,567	32,713
Total assets	42,497	44,277
Financial liabilities (current)	1,561	1,813
Total current liabilities	10,210	9,674
Trade and other payables	119	127
Tax liabilities	470	365
Financial liabilities	5,034	6,481
Other non-financial liabilities	503	461
Provisions	303	217
Deferred tax liabilities	240	411
Deferred income	79	143
Total non-current liabilities	6,747	8,205
Total liabilities	16,958	17,880
Total equity	25,540	26,397
Total equity and liabilities	EUR42,497	EUR44,277

Source: SAP Group 2017 annual report.

Exhibit 9: Apple Inc. Consolidated Balance Sheet (Excerpt: Non-Current Liabilities Detail)* (in millions of US dollars)

Assets	30 September 2017	24 September 2016
Total current assets	128,645	106,869
<i>[All other assets]</i>	<i>246,674</i>	<i>214,817</i>
Total assets	375,319	321,686
Liabilities and shareholders' equity		
Total current liabilities	100,814	79,006
Deferred revenue, non-current	2,836	2,930
Long-term debt	97,207	75,427
Other non-current liabilities	40,415	36,074
<i>[Total non-current liabilities]</i>	<i>140,458</i>	<i>114,431</i>
Total liabilities	241,272	193,437
Total shareholders' equity	134,047	128,249
Total liabilities and shareholders' equity	375,319	321,686

Note: The italicized subtotals presented in this excerpt are not explicitly shown on the face of the financial statement as prepared by the company.

Source: Apple Inc. 2017 annual report (Form 10K).

Long-Term Financial Liabilities

Typical long-term financial liabilities include loans (i.e., borrowings from banks) and notes or bonds payable (i.e., fixed-income securities issued to investors). Liabilities such as loans payable and bonds payable are usually reported at amortized cost on the balance sheet. At maturity, the amortized cost of the bond (carrying amount) will be equal to the face value of the bond. For example, if a company issues USD10,000,000 of bonds at par value, the bonds are reported as a long-term liability of USD10 million. The carrying amount (amortized cost) from the date of issue to the date of maturity remains at USD10 million. As another example, if a company issues USD10,000,000 of bonds at a price of 97.50 percent of par value (a discount to par), the bonds are reported as a liability of USD9,750,000 at issue date. Over the bond's life, the discount of USD250,000 is amortized so that the bond will be reported as a liability of USD10,000,000 at maturity. Similarly, any bond premium would be amortized for bonds issued at a price in excess of par value.

In certain cases, liabilities such as bonds issued by a company are reported at fair value. Those cases include financial liabilities held for trading, derivatives that are a liability to the company, and some non-derivative instruments, such as those which are hedged by derivatives.

SAP's balance sheet in Exhibit 8 shows EUR5,034 million in financial liabilities, and the notes disclose that these liabilities are mostly for bonds payable. Apple's balance sheet in Exhibit 9 shows USD97,207 million in long-term debt, and the notes disclose that this debt includes floating- and fixed-rate notes with varying maturities.

Deferred Tax Liabilities

Deferred tax liabilities result from temporary timing differences between a company's income as reported for tax purposes (taxable income) and income as reported for financial statement purposes (reported income). Deferred tax liabilities result when taxable income, and the actual income tax payable in a period based on it, is less than the reported financial statement income before taxes and the income tax expense based on it. Deferred tax liabilities are defined as the amounts of income taxes payable in future periods in respect of taxable temporary differences.⁸ In contrast, in the previous discussion of unearned revenue, inclusion of revenue in taxable income in an earlier period created a deferred tax asset (essentially prepaid tax).

Deferred tax liabilities typically arise when some expenses are included in taxable income in earlier periods than for financial statement net income. This results in taxable income being less than income before taxes in the earlier periods. As a result, taxes payable based on taxable income are less than income tax expense based on accounting income before taxes. The difference between taxes payable and income tax expense results in a deferred tax liability—for example, when companies use accelerated depreciation methods for tax purposes and straight-line depreciation methods for financial statement purposes. Deferred tax liabilities also arise when some income is included in taxable income in later periods—for example, when a company's subsidiary has profits that have not yet been distributed and thus have not yet been taxed.

SAP's balance sheet in Exhibit 8 shows EUR240 million of deferred tax liabilities. Apple's balance sheet in Exhibit 9 does not show a separate line item for deferred tax liabilities; however, note disclosures indicate that most of the USD40,415 million of other non-current liabilities reported on Apple's balance sheet represents deferred tax liabilities, which totaled USD31,504 million.

Non-current liabilities will be explored in greater detail in a later learning module.

6

RATIOS AND COMMON-SIZE ANALYSIS



calculate and interpret common-size balance sheets and related financial ratios

Analysis of a company's balance sheet can provide insight into the company's liquidity and solvency—as of the balance sheet date—as well as the economic resources the company controls. **Liquidity** refers to a company's ability to meet its short-term financial commitments. Assessments of liquidity focus on a company's ability to convert assets to cash to pay for operating needs. **Solvency** refers to a company's ability to meet its financial obligations over the longer term. Assessments of solvency focus on the company's financial structure and its ability to pay long-term financing obligations. This lesson describes two tools for analyzing the balance sheet: common-size analysis and balance sheet ratios.

⁸ IAS 12, *Income Taxes*, paragraph 5.

Common-Size Analysis of the Balance Sheet

The first technique, vertical common-size analysis, involves stating each balance sheet item as a percentage of total assets.⁹ Common-size balance sheets are useful in comparing a company's balance sheet composition over time (time-series analysis) and across companies in the same industry. To illustrate, Panel A of Exhibit 10 presents balance sheets for three hypothetical companies. Company C, with assets of USD9.75 million is much larger than Company A and Company B, each with only USD3.25 million in assets. The common-size balance sheet presented in Panel B facilitates a comparison of these different-size companies.

Exhibit 10: Balance Sheets for Companies A, B, and C

Panel A: Balance Sheets			
(in thousands of US dollars)	A	B	C
ASSETS			
Current assets			
Cash and cash equivalents	1,000	200	3,000
Short-term marketable securities	900	—	300
Accounts receivable	500	1,050	1,500
Inventory	100	950	300
Total current assets	2,500	2,200	5,100
Property, plant, and equipment, net	750	750	4,650
Intangible assets	—	200	—
Goodwill	—	100	—
Total assets	3,250	3,250	9,750
LIABILITIES AND SHAREHOLDERS' EQUITY			
Current liabilities			
Accounts payable	—	2,500	600
Total current liabilities	—	2,500	600
Long-term bonds payable	10	10	9,000
Total liabilities	10	2,510	9,600
Total shareholders' equity	3,240	740	150
Total liabilities and shareholders' equity	3,250	3,250	9,750
Panel B: Common-Size Balance Sheets			
(Percent)	A	B	C
ASSETS			
Current assets			
Cash and cash equivalents	30.8	6.2	30.8
Short-term marketable securities	27.7	0.0	3.1
Accounts receivable	15.4	32.3	15.4
Inventory	3.1	29.2	3.1

⁹ Another type of common-size analysis, known as "horizontal common-size analysis," states quantities in terms of a selected base-year value. Unless otherwise indicated, text references to "common-size analysis" refer to vertical analysis.

Panel B: Common-Size Balance Sheets

(Percent)	A	B	C
Total current assets	76.9	67.7	52.3
Property, plant, and equipment, net	23.1	23.1	47.7
Intangible assets	0.0	6.2	0.0
Goodwill	0.0	3.1	0.0
Total assets	100.0	100.0	100.0
LIABILITIES AND SHAREHOLDERS' EQUITY			
Current liabilities			
Accounts payable	0.0	76.9	6.2
Total current liabilities	0.0	76.9	6.2
Long-term bonds payable	0.3	0.3	92.3
Total liabilities	0.3	77.2	98.5
Total shareholders' equity	99.7	22.8	1.5
Total liabilities and shareholders' equity	100.0	100.0	100.0

Most of the assets of Company A and B are current assets; however, Company A has nearly 60 percent of its total assets in cash and short-term marketable securities, whereas Company B has only 6 percent of its assets in cash. Company A is more liquid than Company B. Company A shows no current liabilities (its current liabilities round to less than USD10,000), and it has cash on hand of USD1.0 million to meet any near-term financial obligations it might have. In contrast, Company B has USD2.5 million of current liabilities, which exceed its available cash of only USD200,000. To pay those near-term obligations, Company B will need to collect some of its accounts receivables, sell more inventory, borrow from a bank, or raise more long-term capital (e.g., by issuing more bonds or more equity). Company C also appears more liquid than Company B. It holds more than 30 percent of its total assets in cash and short-term marketable securities, and its current liabilities are only 6.2 percent of the amount of total assets.

Company C's USD3.3 million in cash and short-term marketable securities is substantially more than its current liabilities of USD600,000. Turning to the question of solvency, however, note that 98.5 percent of Company C's assets are financed with liabilities. If Company C experiences significant fluctuations in cash flows, it may be unable to pay the interest and principal on its long-term bonds. Company A is far more solvent than Company C, with less than 1 percent of its assets financed with liabilities.

These examples are hypothetical only. Other than general comparisons, little more can be said without further detail. In practice, a wide range of factors affect a company's liquidity management and capital structure. The study **capital structure** is a fundamental issue addressed in Corporate Issuers modules.

Common-size balance sheets can also highlight differences in companies' strategies. Comparing the asset composition of the companies, Company C has made a greater proportional investment in property, plant, and equipment (PP&E)—possibly because it manufactures more of its products in-house. The presence of goodwill on Company B's balance sheet signifies that it has made one or more acquisitions in the past. In contrast, the lack of goodwill on the balance sheets of Company A and Company C suggests that these two companies may have pursued a strategy of internal growth rather than growth by acquisition. Company A may be in either a start-up or liquidation stage of operations as evidenced by the composition of its balance sheet. It has relatively little inventory and no accounts payable. It either has not yet established trade credit or it is in the process of paying off its obligations in the process of liquidating.

COMMON-SIZE ANALYSIS

1. Based on the information presented in Exhibits 2, 6, and 8, which of the following items increased as a percentage of total assets from 2016 to 2017? (Note: More than one answer may be correct.)

- A. Total current assets
- B. Total financial liabilities
- C. Cash and cash equivalents

Solution:

A and C are correct.

Total current assets increased from 26.1 percent of total assets in 2016 ($\text{EUR}11,564 \div \text{EUR}44,277$) to 28.1 percent in 2017 ($\text{EUR}11,930 \div \text{EUR}42,497$).

Cash and cash equivalents increased from 8.4 percent of total assets in 2016 ($\text{EUR}3,702 \div \text{EUR}44,277$) to 9.4 percent in 2017 ($\text{EUR}4,011 \div \text{EUR}42,497$).

Total financial liabilities decreased in 2017 both in absolute euro amounts ($\text{EUR}5,034$) and as a percentage of total assets ($\text{EUR}5,034 \div \text{EUR}42,497 = 11.8\%$) when compared with 2016 ($\text{EUR}6,481 \div \text{EUR}44,277 = 14.6\%$).

Overall, aspects of the company's liquidity position are somewhat stronger in 2017 than in 2016. The company's cash balances as a percentage of total assets increased. While current liabilities increased as a percentage of total assets and total liabilities remained approximately the same percentage, the mix of liabilities shifted. Financial liabilities, which represent future cash outlays, decreased as a percentage of total assets.

Common-size analysis of the balance sheet is particularly useful in cross-sectional analysis—comparing companies to each other for a particular time period or comparing a company with industry or sector data. The analyst could select individual peer companies for comparison, use industry data from published sources, or compile data from databases. When analyzing a company, many analysts prefer to select the peer companies for comparison or to compile their own industry statistics.

Exhibit 11 presents common-size balance sheet data compiled for the 10 sectors of the S&P 500 using 2017 data. The sector classification follows the S&P/MSCI Global Industrial Classification System (GICS). The exhibit presents mean and median common-size balance sheet data for those companies in the S&P 500 for which 2017 data was available in the Compustat database.¹⁰

Some interesting general observations can be made from these data:

- Energy and utility companies have the largest amounts of PP&E. Telecommunication services, followed by utilities, have the highest level of long-term debt. Utilities also use some preferred stock.
- Financial companies have the greatest percentage of total liabilities. Financial companies typically have relatively high financial leverage.
- Utility and real estate companies have the lowest level of receivables.

¹⁰ An entry of zero for an item (e.g., current assets) was excluded from the data, except in the case of preferred stock. Note that most financial institutions did not provide current asset or current liability data, so these are reported as not available in the database.

Exhibit 11: Common-Size Balance Sheet Statistics for the S&P 500 Grouped by S&P/MSCI GICS Sector, 2017 (in percent except for No. of Observations)

Panel A. Median Data											
	10	15	20	25	30	35	40	45	50	55	60
	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care	Financials	Information Technology	Telecommunication Services	Utilities	Real Estate
Number of observation	34	27	68	81	33	59	64	64	4	29	30
Cash and short-term investments	6.8%	6.3%	8.1%	8.3%	4.1%	11.2%	6.2%	22.7%	1.2%	0.7%	1.4%
Receivables	5.8%	8.8%	12.9%	6.8%	6.5%	9.7%	20.4%	9.6%	3.7%	3.6%	2.0%
Inventories	1.6%	8.9%	6.9%	14.9%	9.6%	4.3%	0.0%	1.3%	0.3%	1.7%	0.0%
Total current assets	16.1%	26.0%	30.5%	41.5%	29.1%	31.4%	N.A.	48.7%	8.6%	7.3%	10.8%
PP&E	73.3%	36.3%	12.5%	19.8%	17.2%	8.1%	0.9%	6.2%	35.0%	72.0%	33.4%
Intangibles	1.6%	27.9%	33.3%	16.8%	41.9%	37.6%	2.8%	26.4%	49.6%	6.2%	1.0%
<i>Goodwill</i>	0.7%	20.0%	28.3%	11.3%	26.2%	22.8%	2.2%	22.3%	26.0%	4.8%	0.0%
Accounts payable	5.7%	7.3%	6.2%	8.0%	8.0%	3.1%	27.0%	2.7%	2.5%	3.0%	1.3%
Current liabilities	10.9%	16.5%	22.5%	25.8%	25.0%	16.5%	N.A.	21.2%	11.5%	11.5%	7.1%
Long-term debt	27.3%	31.4%	28.0%	28.7%	32.3%	24.3%	6.4%	22.9%	46.8%	32.5%	43.4%
Total liabilities	49.3%	64.2%	65.5%	64.9%	63.8%	59.2%	86.7%	59.9%	75.8%	71.8%	53.3%
Common equity	47.3%	33.8%	34.5%	34.7%	36.2%	39.4%	12.6%	39.3%	23.9%	27.7%	40.4%
Preferred stock	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total equity	47.3%	33.8%	34.5%	34.7%	36.2%	39.4%	13.2%	39.3%	23.9%	28.0%	41.8%

(Continued from previous Exhibit)

Panel B. Mean Data (Continued from Previous Example)

	10	15	20	25	30	35	40	45	50	55	60
	Energy	Materials	Industrials	Consumer Discretionary	Consumer Staples	Health Care	Financials	Information Technology	Telecommunication Services	Utilities	Real Estate
Number of observations	34	27	68	81	33	59	64	64	4	29	30
Cash and short-term investments	6.9%	7.4%	9.2%	12.9%	7.3%	15.4%	11.2%	28.3%	3.6%	1.3%	2.9%
Receivables	6.6%	10.5%	15.2%	9.0%	7.7%	11.2%	31.5%	11.8%	5.0%	3.8%	3.8%
Inventories	3.4%	9.3%	7.8%	18.3%	10.6%	6.3%	3.8%	4.1%	0.3%	1.6%	0.1%
Total current assets	17.7%	28.8%	32.9%	40.6%	27.8%	36.4%	N.A.	49.4%	10.1%	8.6%	16.1%
PP&E	68.0%	36.9%	24.5%	25.1%	21.6%	11.2%	2.1%	10.3%	39.0%	69.9%	34.9%
Intangibles	7.8%	26.6%	35.6%	23.0%	43.6%	43.9%	11.4%	31.1%	48.2%	6.8%	10.3%
Goodwill	5.4%	18.4%	26.8%	14.6%	24.6%	27.3%	7.7%	24.5%	25.9%	5.7%	5.7%
Accounts payable	5.9%	8.1%	7.1%	11.8%	9.8%	8.1%	35.9%	5.1%	3.1%	2.9%	2.0%
Current liabilities	11.8%	17.0%	23.0%	26.8%	24.6%	21.2%	N.A.	26.1%	11.9%	11.8%	12.8%
Long-term debt	28.3%	31.2%	29.4%	31.3%	32.4%	28.5%	10.3%	24.8%	47.5%	35.0%	44.8%
Total liabilities	50.3%	63.4%	67.1%	67.5%	68.3%	60.1%	80.1%	61.8%	77.6%	73.9%	54.5%
Common equity	46.4%	34.2%	32.3%	32.3%	30.9%	38.9%	18.2%	37.5%	22.2%	24.7%	40.2%
Preferred stock	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.4%	0.3%	0.0%	0.3%	2.2%
Total equity	46.4%	34.2%	32.4%	32.3%	30.9%	39.0%	18.5%	37.8%	22.2%	25.0%	42.3%

PPE = Property, plant, and equipment, LT = Long term.

Source: Based on data from Compustat.

- Inventory levels are highest for consumer discretionary. Materials and consumer staples have the next highest inventories.
- Information technology companies use the least amount of leverage as evidenced by the lowest percentages for long-term debt and total liabilities and highest percentages for common and total equity.

Example 1 discusses an analyst using cross-sectional common-size balance sheet data.

EXAMPLE 1

Cross-Sectional Common-Size Analysis

Jason Lu is comparing two companies in the computer industry to evaluate their relative financial position as reflected on their balance sheets. He has compiled the following vertical common-size data for Apple and Microsoft, which is presented in Exhibit 12.

**Exhibit 12: Cross-Sectional Analysis: Consolidated Balance Sheets
(as percent of total assets)**

	Apple	Microsoft
ASSETS:	30 September 2017	30 June 2017
Current assets:		
Cash and cash equivalents	5.4	3.2
Short-term marketable securities	14.4	52.0
Accounts receivable	4.8	8.2
Inventories	1.3	0.9
Vendor non-trade receivables	4.7	0.0
Other current assets	3.7	2.0
Total current assets	34.3	66.3
Long-term marketable securities	51.9	2.5
Property, plant, and equipment, net	9.0	9.8
Goodwill	1.5	14.6
Acquired intangible assets, net	0.6	4.2
Other assets	2.7	2.6
Total assets	100.0	100.0
LIABILITIES AND SHAREHOLDERS' EQUITY:		
Current liabilities:		
Accounts payable	13.1	3.1
Short-term debt	3.2	3.8
Current portion of long-term debt	1.7	0.4
Accrued expenses	6.9	2.7
Deferred revenue	2.0	14.1
Other current liabilities	0.0	2.6
Total current liabilities	26.9	26.8
Long-term debt	25.9	31.6
Deferred revenue non-current	0.8	4.3
Other non-current liabilities	10.8	7.3
Total liabilities	64.3	70.0

	Apple	Microsoft
ASSETS:	30 September 2017	30 June 2017
Commitments and contingencies		
Total shareholders' equity	35.7	30.0
Total liabilities and shareholders' equity	100.0	100.0

Source: Based on data from companies' annual reports.

From these data, Lu learns the following:

- Apple and Microsoft have high levels of cash and short-term marketable securities, consistent with the information technology sector as reported in Exhibit 11. Apple also has a high balance in long-term marketable securities. This may reflect the success of the company's business model, which has generated large operating cash flows in recent years.
- Apple's level of accounts receivable is lower than Microsoft's and lower than the industry average. Further research is necessary to learn the extent to which this is related to Apple's cash sales through its own retail stores. An alternative explanation would be that the company has been selling or factoring receivables to a greater degree than the other companies; however, that explanation is unlikely given Apple's cash position. Additionally, Apple shows vendor non-trade receivables, reflecting arrangements with its contract manufacturers.
- Apple and Microsoft both have low levels of inventory, similar to industry medians as reported in Exhibit 11. Apple uses contract manufacturers and can rely on suppliers to hold inventory until needed. Additionally, in the Management Discussion and Analysis section of their annual report, Apple discloses USD38 billion of noncancelable manufacturing purchase obligations, USD33 billion of which is due within 12 months. These amounts are not currently recorded as inventory and reflect the use of contract manufacturers to assemble and test some finished products. The use of purchase commitments and contract manufacturers implies that inventory may be "understated." Microsoft's low level of inventory is consistent with its business mix, which is more heavily weighted to software than to hardware.
- Apple and Microsoft have a level of PP&E that is relatively close to the sector median, as reported in Exhibit 11.
- Apple has a very low amount of goodwill, reflecting its strategy to grow organically rather than through acquisition. Microsoft's level of goodwill, while higher than Apple's, is lower than the industry median and mean. Microsoft made a number of major acquisitions (e.g., Nokia in 2014), but subsequently (in 2015) it wrote off significant amounts of goodwill as an impairment charge.
- Apple's level of accounts payable is higher than the computer industry average, but given the company's high level of cash and investments, it is unlikely that this is a problem.
- Apple's and Microsoft's levels of long-term debt are slightly higher than industry averages. Again, given the companies' high level of cash and investments, it is unlikely that this is a problem.

Balance Sheet Ratios

Ratios facilitate time-series and cross-sectional analysis of a company's financial position. **Balance sheet ratios** are those involving balance sheet items only. Each of the line items on a vertical common-size balance sheet is a ratio in that it expresses a balance sheet amount in relation to total assets. Other balance sheet ratios compare one balance sheet item to another. For example, the current ratio expresses current assets in relation to current liabilities as an indicator of a company's liquidity. Balance sheet ratios include **liquidity ratios** (measuring the company's ability to meet its short-term obligations) and **solvency ratios** (measuring the company's ability to meet long-term and other obligations). These ratios and others are discussed in a later reading. Exhibit 13 summarizes the calculation and interpretation of selected balance sheet ratios.

Exhibit 13: Balance Sheet Ratios

Liquidity Ratios	Calculation	Indicates
Current	Current assets ÷ Current liabilities	Ability to meet current liabilities
Quick (acid test)	(Cash + Marketable securities + Receivables) ÷ Current liabilities	Ability to meet current liabilities
Cash	(Cash + Marketable securities) ÷ Current liabilities	Ability to meet current liabilities
Solvency Ratios		
Long-term debt-to-equity	Total long-term debt ÷ Total equity	Financial risk and financial leverage
Debt-to-equity	Total debt ÷ Total equity	Financial risk and financial leverage
Total debt	Total debt ÷ Total assets	Financial risk and financial leverage
Financial leverage	Total assets ÷ Total equity	Financial risk and financial leverage

RATIO ANALYSIS



- Based on its balance sheet presented earlier, the current ratio for SAP Group at 31 December 2017 is *closest* to:

- 1.17.
- 1.20.
- 2.00.

Solution:

A is correct. SAP Group's current ratio (Current assets ÷ Current liabilities) at 31 December 2017 is 1.17 (EUR11,930 million ÷ EUR10,210 million).

- Based on SAP's balance sheets presented earlier, which of the following liquidity ratios decreased in 2017 relative to 2016? (Note: More than one answer may be correct.)

- Cash

B. Quick

C. Current

Solution:

A, B, and C are correct. The cash ratio, quick ratio, and current ratio are lower in 2017 than in 2016.

Liquidity Ratios	Calculation	2017 EUR in millions	2016 EUR in millions
Current	Current assets ÷ Current liabilities	EUR11,930 ÷ EUR10,210 = 1.17	EUR11,564 ÷ EUR9,674 = 1.20
Quick (acid test)*	(Cash + Marketable securities + Receivables) ÷ Current liabilities	(EUR4,011 + EUR990 + EUR5,899) ÷ EUR10,210 = 1.07	(EUR3,702 + EUR1,124 + EUR5,924) ÷ EUR9,674 = 1.11
Cash*	(Cash + Marketable securities) ÷ Current liabilities	(EUR4,011 + EUR990 ÷ EUR10,210 = 0.49	(EUR3,702 + EUR1,124 ÷ EUR9,674 = 0.50

* Marketable securities is assumed to be equal to Other Financial Assets as shown in Exhibit 6.

3. Based on SAP's balance sheets presented earlier, which of the following leverage ratios decreased in 2017 relative to 2016? (Note: more than one answer may be correct.)

A. Debt-to-equity.

B. Financial leverage.

C. Long-term debt-to-equity.

Solution:

A, B, and C are correct. All three leverage ratios decreased in 2017 relative to 2016.

Solvency Ratios

Long-term debt-to-equity	Total long-term debt ÷ Total equity	EUR5,034 ÷ EUR25,540 = 19.7%	EUR6,481 ÷ EUR26,397 = 24.6%
Debt-to-equity	Total debt ÷ Total equity	(EUR1,561 + EUR5,034) ÷ EUR25,540 = 25.8%	(EUR 1,813 + EUR6,481) ÷ EUR26,397 = 31.4%
Financial Leverage	Total assets ÷ Total equity	EUR42,497 ÷ EUR25,540 = 1.66	EUR44,277 ÷ EUR26,397 = 1.68

Cross-sectional financial ratio analysis can be limited by differences in accounting methods. In addition, lack of homogeneity of a company's operating activities can limit comparability. For diversified companies operating in different industries, using industry-specific ratios for different lines of business can provide better comparisons. Companies disclose information on operating segments. The financial position and performance of the operating segments can be compared to the relevant industry.

Ratio analysis requires a significant amount of judgment. One key area requiring judgment is understanding the limitations of any ratio. The current ratio, for example, is only a rough measure of liquidity at a specific point in time. The ratio captures only the amount of current assets, but the components of current assets differ significantly in their nearness to cash (e.g., marketable securities versus inventory).

Another limitation of the current ratio is its sensitivity to end-of-period financing and operating decisions that potentially can affect current asset and current liability amounts. Another overall area requiring judgment is determining whether a ratio for a company is within a reasonable range for an industry. Yet another area requiring judgment is evaluating whether a ratio signifies a persistent condition or reflects only a temporary condition. Overall, evaluating specific ratios requires an examination of the entire operations of a company, its competitors, and the external economic and industry setting in which it is operating.

PRACTICE PROBLEMS

1. All of the following are current assets *except*:
 - A. cash.
 - B. goodwill.
 - C. inventories.
2. The initial measurement of goodwill is *most likely* affected by:
 - A. an acquisition's purchase price.
 - B. the acquired company's book value.
 - C. the fair value of the acquirer's assets and liabilities.
3. For financial assets classified as trading securities, how are unrealized gains and losses reflected in shareholders' equity?
 - A. They are not recognized.
 - B. They flow through income into retained earnings.
 - C. They are a component of accumulated other comprehensive income.
4. For financial assets classified as available for sale, how are unrealized gains and losses reflected in shareholders' equity?
 - A. They are not recognized.
 - B. They flow through retained earnings.
 - C. They are a component of accumulated other comprehensive income.
5. For financial assets classified as held to maturity, how are unrealized gains and losses reflected in shareholders' equity?
 - A. They are not recognized.
 - B. They flow through retained earnings.
 - C. They are a component of accumulated other comprehensive income.
6. A company has total liabilities of GBP35 million and total stockholders' equity of GBP55 million. Total liabilities are represented on a vertical common-size balance sheet by a percentage *closest* to:
 - A. 35 percent.
 - B. 39 percent.
 - C. 64 percent.
7. Which of the following would an analyst *most likely* be able to determine from a common-size analysis of a company's balance sheet over several periods?
 - A. An increase or decrease in sales

- B. An increase or decrease in financial leverage
 - C. A more efficient or less efficient use of assets
8. Defining total asset turnover as revenue divided by average total assets, all else equal, impairment write-downs of long-lived assets owned by a company will *most likely* result in an increase for that company in:
- A. the debt-to-equity ratio but not the total asset turnover.
 - B. the total asset turnover but not the debt-to-equity ratio.
 - C. both the debt-to-equity ratio and the total asset turnover.
9. An investor concerned about a company's ability to meet its near-term obligations is *most likely* to calculate the:
- A. current ratio.
 - B. return on total capital.
 - C. financial leverage ratio.
10. The most stringent test of a company's liquidity is its:
- A. cash ratio.
 - B. quick ratio.
 - C. current ratio.
11. An investor worried about a company's long-term solvency would *most likely* examine its:
- A. current ratio.
 - B. return on equity.
 - C. debt-to-equity ratio.
12. Consider the common-size balance sheets in Exhibit 1 for Company A, Company B, as well as the industry average. Which statement is correct?

Exhibit 1: Balance Sheet and Industry Average

	Company A	Company B	Industry Average
ASSETS			
Current assets			
Cash and cash equivalents	5	5	7
Marketable securities	5	0	2
Accounts receivable, net	5	15	12
Inventories	15	20	16
Prepaid expenses	5	15	11
Total current assets	35	55	48

	Company A	Company B	Industry Average
Property, plant, and equipment, net	40	35	37
Goodwill	25	0	8
Other assets	0	10	7
Total assets	100	100	100
LIABILITIES AND SHAREHOLDERS' EQUITY			
Current liabilities			
Accounts payable	10	10	10
Short-term debt	25	10	15
Accrued expenses	0	5	3
Total current liabilities	35	25	28
Long-term debt	45	20	28
Other non-current liabilities	0	10	7
Total liabilities	80	55	63
Total shareholders' equity	20	45	37
Total liabilities and shareholders' equity	100	100	100

- A. Company A has below-average liquidity risk.
 - B. Company B has above-average solvency risk.
 - C. Company A has made one or more acquisitions.
13. The quick ratio for Company A is *closest* to:
- A. 0.43.
 - B. 0.57.
 - C. 1.00.
14. The financial leverage ratio for Company B is *closest* to:
- A. 0.55.
 - B. 1.22.
 - C. 2.22.
15. Which ratio indicates lower liquidity risk for Company A compared with Company B?
- A. Cash ratio
 - B. Quick ratio
 - C. Current ratio

SOLUTIONS

1. B is correct. Goodwill is a long-term asset, and cash and inventories are current assets.
2. A is correct. Initially, goodwill is measured as the difference between the purchase price paid for an acquisition and the fair value of the acquired, not acquiring, company's net assets (identifiable assets less liabilities).
3. B is correct. For financial assets classified as trading securities, unrealized gains and losses are reported on the income statement and flow to shareholders' equity as part of retained earnings.
4. C is correct. For financial assets classified as available for sale, unrealized gains and losses are not recorded on the income statement and instead are part of *other* comprehensive income. Accumulated other comprehensive income is a component of shareholders' equity.
5. A is correct. Financial assets classified as held to maturity are measured at amortized cost. Gains and losses are recognized only when realized.
6. B is correct. Vertical common-size analysis involves stating each balance sheet item as a percentage of total assets. Total assets are the sum of total liabilities (GBP35 million) and total stockholders' equity (GBP55 million), or GBP90 million. Total liabilities are shown on a vertical common-size balance sheet as $(\text{GBP}35 \text{ million} \div \text{GBP}90 \text{ million}) \approx 39\%$.
7. B is correct. A common-size balance sheet analysis provides information about the composition of the balance sheet and it changes over time. As a result, it can provide information about an increase or decrease in a company's financial leverage.
8. C is correct. Impairment write-downs reduce equity in the denominator of the debt-to-equity ratio but do not affect debt, so the debt-to-equity ratio is expected to increase. Impairment write-downs reduce total assets but do not affect revenue. Thus, total asset turnover is expected to increase.
9. A is correct. The current ratio provides a comparison of assets that can be turned into cash relatively quickly and liabilities that must be paid within one year. The other ratios are more suited to evaluate longer-term concerns.
10. A is correct. The cash ratio determines how much of a company's near-term obligations can be settled with existing amounts of cash and marketable securities.
11. C is correct. The debt-to-equity ratio, a solvency ratio, is an indicator of financial risk.
12. C is correct. The presence of goodwill on Company A's balance sheet signifies that it has made one or more acquisitions in the past. The current, cash, and quick ratios are lower for Company A than for the sector average. These lower liquidity ratios imply above-average liquidity risk. The total debt, long-term debt-to-equity, debt-to-equity, and financial leverage ratios are lower for Company B than for the sector average. These lower solvency ratios imply below-average solvency risk.

Current ratio is $(35 \div 35) = 1.00$ for Company A, versus $(48 \div 28)$

= 1.71 for the sector average.

Cash ratio is $(5 + 5) \div 35 = 0.29$ for Company A, versus $(7 + 2) \div 28 = 0.32$ for the sector average.

Quick ratio is $(5 + 5 + 5) \div 35 = 0.43$ for Company A, versus $(7 + 2 + 12) \div 28 = 0.75$ for the sector average.

Total debt ratio is $(55 \div 100) = 0.55$ for Company B, versus $(63 \div 100) = 0.63$ for the sector average.

Long-term debt-to-equity ratio is $(20 \div 45) = 0.44$ for Company B, versus $(28 \div 37) = 0.76$ for the sector average.

Debt-to-equity ratio is $(55 \div 45) = 1.22$ for Company B, versus $(63 \div 37) = 1.70$ for the sector average.

Financial leverage ratio is $(100 \div 45) = 2.22$ for Company B, versus $(100 \div 37) = 2.70$ for the sector average.

13. A is correct. The quick ratio is defined as (Cash and cash equivalents + Marketable securities + receivables) $\div$ Current liabilities. For Company A, this calculation is $(5 + 5 + 5) \div 35 = 0.43$.
14. C is correct. The financial leverage ratio is defined as Total assets $\div$ Total equity. For Company B, total assets are 100 and total equity is 45; hence, the financial leverage ratio is $100 \div 45 = 2.22$.
15. A is correct. A higher cash ratio reflects lower liquidity risk. The cash ratio is defined as (Cash + Marketable securities) $\div$ Current liabilities. Company A's cash ratio, $(5 + 5) \div 35 = 0.29$, is higher than $(5 + 0) \div 25 = 0.20$ for Company B.

LEARNING MODULE

4

Analyzing Statements of Cash Flows I

by Elaine Henry, PhD, CFA, Thomas R Robinson, PhD, CFA, CAIA, J. Hennie van Greuning, DCom, CFA, and Michael A Broihahn, CPA, CIA, CFA.

Elaine Henry, PhD, CFA, is at Stevens Institute of Technology (USA). Thomas R. Robinson, PhD, CFA, CAIA, Robinson Global Investment Management LLC, (USA). J. Hennie van Greuning, DCom, CFA, is at BIBD (Brunei). Michael A. Broihahn, CPA, CIA, CFA, is at Barry University (USA).

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe how the cash flow statement is linked to the income statement and the balance sheet
☐	describe the steps in the preparation of direct and indirect cash flow statements, including how cash flows can be computed using income statement and balance sheet data
☐	demonstrate the conversion of cash flows from the indirect to direct method
☐	contrast cash flow statements prepared under International Financial Reporting Standards (IFRS) and US generally accepted accounting principles (US GAAP)

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

1

INTRODUCTION

The statement of cash flows provides important information about a company's cash receipts and cash payments during an accounting period, reconciling the cash accounts between balance sheet dates. Although the income statement provides similar measures on an accrual basis, cash flows and their timing are crucial to valuation as payments to investors are made in cash. Investors also use statement of cash flows to evaluate the company's liquidity, solvency, and financial flexibility. In this module, we discuss the components of the cash flow statement and its links to the other financial statements.

LEARNING MODULE OVERVIEW



- Understanding the interrelationships among the balance sheet, income statement, and cash flow statement is useful not only in evaluating the company's financial health but also in detecting accounting irregularities.
- The income statement and statement of cash flows provide key linkages between the current assets and current liabilities sections of the balance sheet.
- Companies can use either the direct or the indirect method for reporting their operating cash flow:
- The direct method discloses operating cash inflows by source (e.g., cash received from customers, cash received from investment income) and operating cash outflows by use (e.g., cash paid to suppliers, cash paid for interest) in the operating activities section of the cash flow statement.
- The indirect method reconciles net income to operating cash flow by adjusting net income for all non-cash items and the net changes in working capital accounts.
- Although the indirect method is most common, an analyst may desire to review direct-format operating cash flow to review trends in cash receipts and payments, such as cash received from customers or cash paid to suppliers.
- Cash flows from operating activities reported under the indirect method can generally be converted to an approximation of the direct format by following a simple three-step process.
- Cash flows from investing activities and from financing activities are both reported using a direct method, regardless of the method used for reporting operating cash flows.
- Compared with US GAAP, the International Financial Reporting Standards (IFRS) allow more flexibility in the classification of items as operating, investing, or financing activities, such as interest paid or received and dividends paid or received and in how income tax expense is classified.

LINKAGES BETWEEN THE FINANCIAL STATEMENTS

2



describe how the cash flow statement is linked to the income statement and the balance sheet

Primary Financial Statements

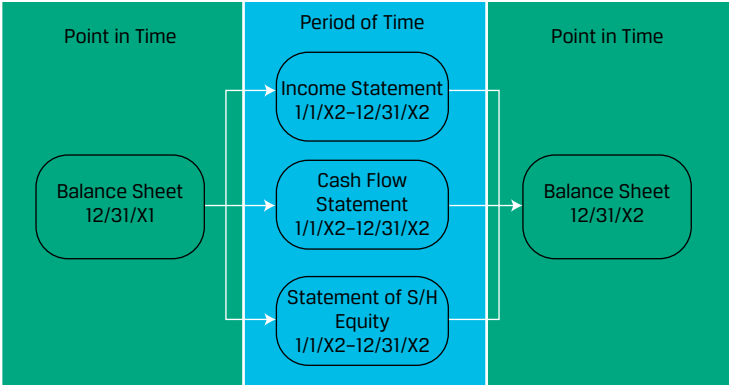
Recall that the four primary financial statements are interrelated and each provides specific information to analysts about an entity. The primary financial statements are as follows:

1. **Balance Sheet**—shows the financial position of an entity *at a point in time*, reporting the balances of “permanent” or “stock” accounts showing the entity’s assets and how those assets are financed.
2. **Income Statement**—provides information about a company’s financial performance between balance sheet dates. The income statement is made up of revenue, expense, gain, and loss accounts. In contrast to the balance sheet, the income statement is a “flow” statement as it captures income activity between two balance sheet dates. Income statements prepared under IFRS or US GAAP are based on accrual accounting, so they do not necessarily reflect cash inflows and outflows.
3. **Statement of Cash Flows**—reports the change in an entity’s cash, cash equivalents, and restricted cash between balance sheet dates. The statement classifies cash inflows and outflows during the period as operating, investing, or financing activities. Because the cash flow statement reports performance over a period of time, it is also a “flow” statement, like the income statement.
4. **Statement of Shareholder’s Equity**—provides information about how a company’s equity has changed between balance sheet dates. The statement identifies the significant components of shareholders equity that are reported on the balance sheet (e.g., common stock and retained earnings) and the activities that occurred during the period that impacted these accounts (e.g., share issuance, net income or loss). Like the income statement and statement of cash flows, the statement of shareholders equity is also a “flow” statement.

Relationship between Financial Statements

As illustrated in Exhibit 1, the income statement, cash flow statement and statement of shareholders’ equity link the balance sheet from one period to the next.

Exhibit 1: Relationship between the Financial Statements

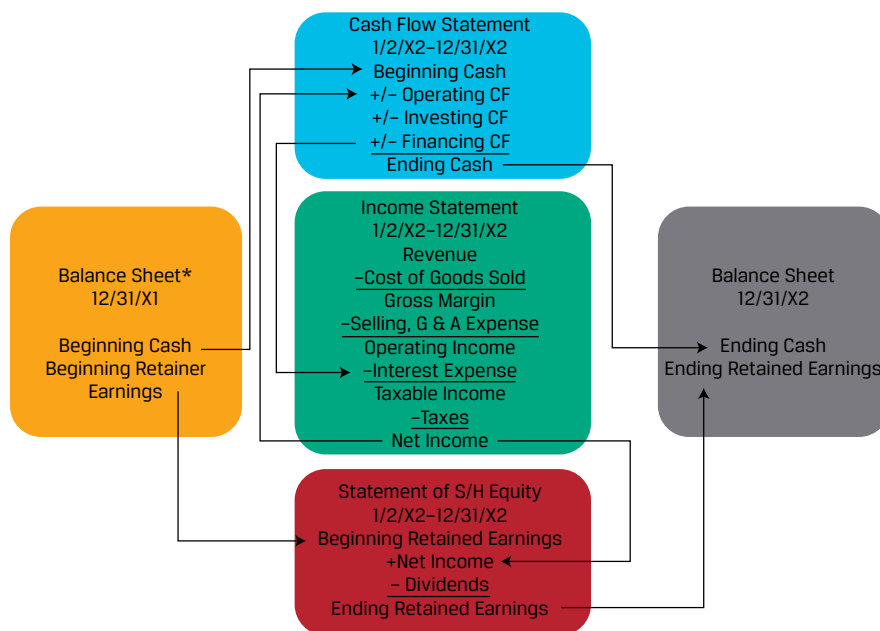


For example, the beginning and ending balances of cash are shown on the company’s 20X1 and 20X2 balance sheets, and the bottom of the 20X2 cash flow statement reconciles 20X1 cash to 20X2 cash. The relationship, stated in general terms, is as shown in Exhibit 2.

Exhibit 2: Beginning and Ending Balances

Balance Sheet at 31 December 20X1	Statement of Cash Flows for Year Ended 31 December 20X2		Balance Sheet at 31 December 20X2
Beginning cash (as of Year-end 31 December 20x1)	Plus: Cash inflows (from oper- ating, investing, and financing activities)	Less: Cash outflows (for oper- ating, investing, and financing activities)	Ending cash (as of Year-end 31 December 20x2)

Exhibit 3 adds greater detail to Exhibit 1, tracing specific linkages through the four financial statements.

Exhibit 3: Interaction of Financial Statement Accounts

For example, the 20X2 statement of shareholders' equity reconciles the equity accounts reported on 20X1 balance sheet to the equity accounts reported on the 20X2 balance sheet, including additions (or subtractions) resulting from net income or loss reported on the income statement and dividends paid that are also reported on the statement of cash flows if made in cash.

Linkages Between Current Assets and Current Liabilities

The income statement and statement of cash flows also provide key linkages between the current assets and current liabilities sections of the balance sheet. Differences between the accrual and cash accounting recognition of operating activities result in an increase or decrease in a current asset or liability on the balance sheet. For example, accrual basis revenue in excess of cash collections will be accompanied by an increase in accounts receivable. If expenses reported using accrual accounting are lower than cash actually paid, the result will typically be a decrease in accounts payable or another accrued liability account. Finally, in situations in which a company is paid in advance for the delivery of a service or product in the future, it will recognize the cash received as an asset, but it also must recognize a liability for its obligation to deliver service or product in the future, typically referred to as deferred revenue. A deferred revenue liability account is derecognized upon the recognition of revenue when the entity satisfies its performance obligations.

If an analyst knows beginning accounts receivable, revenues, and cash collected from customers, they can compute ending accounts receivable, as the accounts are linked as shown in Exhibit 4.

Exhibit 4: Ending Accounts Receivable

Beginning Balance Sheet at 31 December 20X1	Income Statement for Year Ended 31 December 20X1	Statement of Cash Flows for Year Ended 31 December 20X1	Ending Balance Sheet at 31 December 20X2
Beginning accounts receivable	Plus: Revenues	Minus: Cash collected from customers	Equals: Ending accounts receivable

Understanding the interrelationships among the balance sheet, income statement, and cash flow statement is useful not only in evaluating the company's financial health but also in detecting accounting irregularities. Recall the extreme illustration of a hypothetical company that makes sales on account without regard to future collections and thus reports healthy sales and significant income on its income statement yet lacks cash inflow. Such a pattern would occur if a company improperly recognized revenue.

Example 1–Example 4 demonstrate how common business transactions affect a company's balance sheet, income statement, and statement of cash flows. Notice how all three financial statements are needed to fully account for the transactions.

EXAMPLE 1**Inventory Purchase and Sale Impact on Financial Statements**

Assume fictional company ABC, a retailer, purchases USD100 of inventory on 1 January 1, 20X1 on credit with payment due to its supplier in 30 days. On 1 February, ABC sells the product to Customer X for USD150 with payment due by 16 February, 20X1. Customer X pays for the product on 15 February, 20X1.

This series of transaction would affect ABC's financial statements as follows shown in Exhibit 5.

Exhibit 5: ABC's Financial Statements

Date	Balance Sheet	Income Statement	Statement of Cash Flows
1 January	Inventory (asset) increases by USD100 Accounts Payable (liability) increases by USD100	N/A	N/A
30 January	Cash (asset) decreases by USD100 Accounts Payable (liability) decreases by USD100	N/A	Cash flows from operating activities decreases by USD100
1 February	Accounts Receivable (asset) increases by USD150 Inventory (asset) decreases by USD100	Revenue increases by USD150 Cost of sales increases by USD100	N/A
15 February	Cash (asset) increases by USD150 Accounts receivable (asset) decreases by USD150		Cash flows from operating activities increases by USD100

Note the statement of cash flows is affected only when the company pays or receives cash, which differs from recognition on the income statement.

EXAMPLE 2**Depreciation Impact on Financial Statements**

On 1 January, fictional company Notion Ltd, a manufacturing company, owns USD100 of equipment used in the production of a product that is sold to whole-sale customers. The equipment has a 10-year life and no salvage value. Notion uses straight-line depreciation, so the annual depreciation expense is USD10. On 1 July, Notion Ltd. makes a new capital investment for a different piece of equipment with a purchase price of USD200 and annual depreciation expense of USD50. Notion Ltd. pays for the equipment in cash upon receipt. Depreciation expense is recorded at the end of the fiscal year. The impact on Notion Ltd.'s financial statements is summarized in Exhibit 6.

Exhibit 6: Notion Ltd. Financial Statement

Date	Balance Sheet	Income Statement	Statement of Cash Flows
1 January	Equipment (asset) of USD100	N/A	N/A
1 July	Equipment (asset) increases by USD200 Cash (asset) decreases by USD200	N/A	Cash flows from investing activities decreases by USD200
31 December	Accumulated Depreciation (contra asset) increases by USD35	Depreciation expense increases by USD35	N/A

EXAMPLE 3**Borrowing Impact on Financial Statements**

On 31 March, fictional Geneva Company borrows USD500 from Stockholm Bank (also fictional). The terms of the loan are interest accrues at 10 percent and payment is due along with principal upon maturity of the loan on 30 September. Accordingly, Geneva is to pay USD525 to Stockholm Bank on 30 September consisting of USD500 in loan principal and USD25 of interest ($\text{USD500 loan} \times 10\% \times \frac{1}{2} \text{ year}$.) The impact on Geneva's financial statements is summarized in Exhibit 7.

Exhibit 7: Geneva Financial Statement

Date	Balance Sheet	Income Statement	Statement of Cash Flows
31 March	Cash (asset) increases by USD500 Loans payable (liability) increases by USD500	N/A	Cash flows from financing activities increases by USD500
30 September	Cash (asset) decreases by USD525 Loans payable (liability) decreases by USD500	Interest expense increases by USD25	Cash flows from financing or operating activities decreases by USD25 Cash flows from financing activities decreases by USD500

EXAMPLE 4**Equipment Purchase Impact on Financial Statements**

Assume Mountain Company, a fictional manufacturer, agrees to produce a custom-made piece of equipment for Cirrus Corp. (another fictional company) in two months for a sales price of USD1,000. On 1 October, Cirrus provides Mountain with a down payment of USD300 from Cirrus and agrees to pay the balance of USD700 when the equipment is delivered on 30 November. Mountain Company recognizes deferred revenue when it receives the USD300 on 1 October, which will be derecognized when Mountain fulfills its obligation and delivers the equipment. The impact on Mountain Company's financial statement is summarized in Exhibit 8.

Exhibit 8: Mountain Company Financial Statement

Date	Balance Sheet	Income Statement	Statement of Cash Flows
1 October	Cash (asset) increases by USD300 Deferred revenue (liability) increases by USD300	N/A	Cash flows from operating activities increases by USD300
30 September	Cash (asset) increases by USD700 Deferred revenue (liability) decreases by USD300	Revenue increases by USD1,000	Cash flows from operating activities increases by USD700

THE DIRECT METHOD FOR CASH FLOWS FROM OPERATING ACTIVITIES

3

- ☐ describe the steps in the preparation of direct and indirect cash flow statements, including how cash flows can be computed using income statement and balance sheet data

The first step in preparing the cash flow statement is to determine cash flows from operating activities, which can be presented using the direct or indirect method. The direct method uses the major categories of gross cash receipts and payments, and the indirect method reconciles net income to net cash flow. Cash flows from investing activities and from financing activities are identical regardless of whether the direct or indirect method is used to present operating cash flows.

- Companies often disclose only indirect operating cash flow information but understanding how cash flow information is put together will enable you to take an indirect statement apart and reconfigure it to approximate a direct cash flow statement, which—while not perfectly accurate—can be useful. This lesson demonstrates the approximate preparation of a direct cash flow statement using the income statement and the comparative balance sheets for Acme Corporation (a fictitious retail company) shown in Exhibit 9 and Exhibit 10.

Exhibit 9: Acme Corporation Income Statement Year Ended 31 December 2018

Revenue (net)		USD23,598
Cost of goods sold		11,456
Gross profit		12,142
Salary and wage expense	USD4,123	
Depreciation expense	1,052	
Other operating expenses	3,577	
Total operating expenses		8,752
Operating profit		3,390
Other revenues (expenses):		
Gain on sale of equipment	205	
Interest expense	(246)	(41)
Income before tax		3,349
Income tax expense		1,139
Net income		USD2,210

Exhibit 10: Acme Corporation Comparative Balance Sheets 31 December 2018 and 2017

	2018	2017	Net Change
Cash	USD1,011	USD1,163	USD(152)

Accounts receivable	1,012	957	55
Inventory	3,984	3,277	707
Prepaid expenses	155	178	(23)
Total current assets	6,162	5,575	587
Land	510	510	—
Buildings	3,680	3,680	—
Equipment*	8,798	8,555	243
Less: accumulated depreciation	(3,443)	(2,891)	(552)
Total long-term assets	9,545	9,854	(309)
Total assets	USD15,707	USD15,429	USD278
Accounts payable	USD3,588	USD3,325	USD263
Salary and wage payable	85	75	10
Interest payable	62	74	(12)
Income tax payable	55	50	5
Other accrued liabilities	1,126	1,104	22
Total current liabilities	4,916	4,628	288
Long-term debt	3,075	3,575	(500)
Common stock	3,750	4,350	(600)
Retained earnings	3,966	2,876	1,090
Total liabilities and equity	USD15,707	USD15,429	USD278

* During 2018, Acme purchased new equipment for a total cost of \$1,300. No items impacted retained earnings other than net income and dividends.

Operating Activities: Direct Method

We first determine how much cash Acme received from its customers (sometimes referred to as “cash collections”), followed by how much cash was paid to suppliers and to employees, as well as how much cash was paid for other operating expenses, interest, and income taxes.

Cash Received From Customers

The income statement for Acme reported revenue of USD23,598 for the year ended 31 December 2018. To determine the approximate cash receipts from its customers, it is necessary to adjust this revenue amount by the net change in accounts receivable for the year. If accounts receivable increase during the year, revenue on an accrual basis is higher than cash receipts from customers, and vice versa. For Acme Corporation, accounts receivable increased by USD55, so cash received from customers was USD23,543, as shown in Exhibit 11.

Exhibit 11: Cash Received from Customers

Revenue	USD23,598
Less: Increase in accounts receivable	(USD55)
Cash received from customers	USD23,543

Cash received from customers affects the accounts receivable account as shown in Exhibit 12.

Exhibit 12: Effect on Accounts Receivable, 1

Beginning accounts receivable	957
Plus revenue	23,598
Minus cash collected from customers	<u>(23,543)</u>
Ending accounts receivable	USD1,012

The accounts receivable account information can also be presented as shown in Exhibit 13.

Exhibit 13: Effect on Accounts Receivable, 2

Beginning accounts receivable	USD957
Plus revenue	23,598
Minus ending accounts receivable	<u>(1,012)</u>
Cash collected from customers	<u>USD23,543</u>

Acme did not have any deferred or unearned revenue. If it did, further adjustment would be required to arrive at cash collected from customers (a decrease in deferred revenue would be a negative adjustment and vice versa).

EXAMPLE 5
Computing Cash Received from Customers

1. Blue Bayou, a fictitious advertising company, reported revenues of USD50 million, total expenses of USD35 million, and net income of USD15 million in the most recent year. If accounts receivable decreased by USD12 million, how much cash did the company receive from customers?

- A. USD38 million
- B. USD50 million
- C. USD62 million

Solution:

C is correct. Revenues of USD50 million plus the decrease in accounts receivable of USD12 million equals USD62 million cash received from customers. The decrease in accounts receivable means that the company received more in cash than the amount of revenue it reported.

Cash Paid to Suppliers

For Acme, the cash paid to suppliers was USD11,900, determined as shown in Exhibit 14.

Exhibit 14: Cash Paid to Suppliers

Cost of goods sold	USD11,456
Plus: Increase in inventory	707
Equals purchases from suppliers	USD12,163
Less: Increase in accounts payable	(263)
Cash paid to suppliers	USD11,900

There are two pieces to this calculation: the amount of inventory purchased and the amount paid for it. To determine purchases from suppliers, cost of goods sold is adjusted for the change in inventory. If inventory increased during the year, then purchases during the year exceeded cost of goods sold, and vice versa. Acme reported cost of goods sold of USD11,456 for the year ended 31 December 2018. For Acme Corporation, inventory increased by USD707, so purchases from suppliers was USD12,163. Purchases from suppliers affect the inventory account, as shown in Exhibit 15.

Exhibit 15: Effect on Inventory

Beginning inventory	USD3,277
Plus purchases	12,163
Minus cost of goods sold	(11,456)
Ending inventory	USD3,984

Acme purchased USD12,163 of inventory from suppliers in 2018, but is this the amount of cash that Acme paid to its suppliers during the year? Not necessarily. Acme may not have yet paid for all of these purchases and may yet owe for some of the purchases made this year. In other words, Acme may have paid less cash to its suppliers than the amount of this year's purchases, in which case Acme's liability (accounts payable) will have increased by the difference. Alternatively, Acme may have paid even more to its suppliers than the amount of this year's purchases, in which case Acme's accounts payable will have decreased.

Therefore, once purchases have been determined, cash paid to suppliers can be calculated by adjusting purchases for the change in accounts payable. If the company made all purchases with cash, then accounts payable would not change and cash outflows would equal purchases. If accounts payable increased during the year, then purchases on an accrual basis would be higher than they would be on a cash basis, and vice versa. In this example, Acme made more purchases than it paid in cash, so the balance in accounts payable increased. For Acme, the cash paid to suppliers was USD11,900, determined as shown in Exhibit 16.

Exhibit 16: Cash Paid to Suppliers

Purchases from suppliers	USD12,163
Less: Increase in accounts payable	(263)
Cash paid to suppliers	USD11,900

The amount of cash paid to suppliers is reflected in the accounts payable account, as shown in Exhibit 17.

Exhibit 17: Cash Paid to Suppliers

Beginning accounts payable	USD3,325
Plus purchases	12,163
Minus cash paid to suppliers	(11,900)
Ending accounts payable	USD3,588

EXAMPLE 6**Computing Cash Paid to Suppliers**

1. Orange Beverages Plc., a fictitious manufacturer of tropical drinks, reported cost of goods sold for the year of USD100 million. Total assets increased by USD55 million, but inventory declined by USD6 million. Total liabilities increased by USD45 million, but accounts payable decreased by USD2 million. How much cash did the company pay to its suppliers during the year?

- A. USD96 million
- B. USD104 million
- C. USD108 million

Solution:

A is correct. Cost of goods sold of USD100 million less the decrease in inventory of USD6 million equals purchases from suppliers of USD94 million. The decrease in accounts payable of USD2 million means that the company paid USD96 million in cash (USD94 million plus USD2 million).

Cash Paid to Employees

To determine the cash paid to employees, it is necessary to adjust salary and wage expenses by the net change in salary and wages payable for the year. If salary and wages payable increased during the year, then salary and wage expenses on an accrual basis would be higher than the amount of cash paid for this expense, and vice versa. For Acme, salary and wages payable increased by USD10, so cash paid for salary and wages was USD4,113, as shown in Exhibit 18.

Exhibit 18: Salary and Wages

Salary and wages expense	USD4,123
Less: Increase in salary and wages payable	(10)
Cash paid to employees	USD4,113

The amount of cash paid to employees is reflected in the salary and wages payable account, as shown in Exhibit 19.

Exhibit 19: Cash Paid to Employees

Beginning salary and wages payable	USD75
Plus salary and wages expense	4,123

Minus cash paid to employees	(4,113)
Ending salary and wages payable	USD85

Cash Paid for Other Operating Expenses

To determine the cash paid for other operating expenses, it is necessary to adjust the other operating expense amounts on the income statement by the net changes in pre-paid expenses and accrued expense liabilities for the year. If prepaid expenses increased during the year, other operating expenses on a cash basis would be higher than on an accrual basis, and vice versa. Likewise, if accrued expense liabilities increased during the year, other operating expenses on a cash basis would be lower than on an accrual basis, and vice versa. For Acme Corporation, the amount of cash paid for operating expenses in 2018 was USD3,532, as shown in Exhibit 20.

Exhibit 20: Cash Paid for Operating Expenses

Other operating expenses	USD3,577
Less: Decrease in prepaid expenses	(23)
Less: Increase in other accrued liabilities	(22)
Cash paid for other operating expenses	USD3,532

EXAMPLE 7

Computing Cash Paid for Other Operating Expenses

1. Black Ice, a fictitious sportswear manufacturer, reported other operating expenses of USD30 million. Prepaid insurance expense increased by USD4 million, and accrued utilities payable decreased by USD7 million. Insurance and utilities are the only two components of other operating expenses. How much cash did the company pay in other operating expenses?

- A. USD19 million
- B. USD33 million
- C. USD41 million

Solution:

C is correct. Other operating expenses of USD30 million plus the increase in prepaid insurance expense of USD4 million plus the decrease in accrued utilities payable of USD7 million equals USD41 million.

Cash Paid for Interest

The cash paid for interest is included in operating cash flows under US GAAP and may be included in operating or financing cash flows under IFRS. To determine the cash paid for interest, it is necessary to adjust interest expense by the net change in interest payable for the year. If interest payable increases during the year, then interest expense on an accrual basis will be higher than the amount of cash paid for interest, and vice versa. For Acme Corporation, interest payable decreased by USD12, and cash paid for interest was USD258, as shown in Exhibit 21.

Exhibit 21: Cash Paid for Interest

Interest expense	USD246
Plus: Decrease in interest payable	12
Cash paid for interest	USD258

Alternatively, cash paid for interest may also be determined by an analysis of the interest payable account, as shown in Exhibit 22.

Exhibit 22: Interest Payable Account

Beginning interest payable	USD74
Plus interest expense	246
Minus cash paid for interest	(258)
Ending interest payable	USD62

Cash Paid for Income Taxes

To determine the cash paid for income taxes, it is necessary to adjust the income tax expense amount on the income statement by the net changes in taxes receivable, taxes payable, and deferred income taxes for the year. If taxes receivable or deferred tax assets increase during the year, income taxes on a cash basis will be higher than on an accrual basis, and vice versa. Likewise, if taxes payable or deferred tax liabilities increase during the year, income tax expense on a cash basis will be lower than on an accrual basis, and vice versa. For Acme Corporation, the amount of cash paid for income taxes in 2018 was USD1,134, as shown in Exhibit 23.

Exhibit 23: Cash Paid for Income Taxes

Income tax expense	USD1,139
Less: Increase in income tax payable	(5)
Cash paid for income taxes	USD1,134

THE INDIRECT METHOD FOR CASH FLOWS FROM OPERATING ACTIVITIES

4



describe the steps in the preparation of direct and indirect cash flow statements, including how cash flows can be computed using income statement and balance sheet data

The alternative approach to reporting cash from operating activities is the indirect method. In this lesson, we reconcile Acme's net income to its operating cash flow using the indirect method.

Operating Activities: Indirect Method

To perform this reconciliation, net income is adjusted for the following: (1) any non-operating activities, (2) any non-cash expenses, and (3) changes in operating working capital items.

The only non-operating activity in Acme’s income statement, the sale of equipment, resulted in a gain of USD205. This amount is removed from the operating cash flow section; the cash effects of the sale are shown in the investing section.

Acme’s only non-cash expense was a depreciation expense of USD1,052. Under the indirect method, this depreciation expense must be added back to net income because it was a non-cash deduction in the calculation of net income.

Changes in working capital accounts include increases and decreases in the current operating asset and liability accounts. The changes in these accounts arise from applying accrual accounting—that is, recognizing revenues when they are earned and expenses when they are incurred instead of when the cash is received or paid. To make the working capital adjustments under the indirect method, any increase in a current operating asset account is subtracted from net income and a net decrease is added to net income. As described previously, the increase in accounts receivable, for example, resulted from Acme recording income statement revenue higher than the amount of cash received from customers. Therefore, to reconcile back to operating cash flow, that increase in accounts receivable must be deducted from net income. For current operating liabilities, a net increase is added to net income and a net decrease is subtracted from net income. As described previously, the increase in wages payable, for example, resulted from Acme recording income statement expenses higher than the amount of cash paid to employees.

Exhibit 24 presents a tabulation of the most common types of adjustments that are made to net income when using the indirect method to determine net cash flow from operating activities.

Exhibit 24: Adjustments to Net Income Using the Indirect Method	
Additions	▪ Non-cash items • Depreciation expense of tangible assets • Amortization expense of intangible assets • Depletion expense of natural resources • Amortization of bond discount ▪ Non-operating losses • Loss on sale or write-down of assets • Loss on retirement of debt • Loss on investments accounted for under the equity method ▪ Increase in deferred income tax liability ▪ Changes in working capital resulting from accruing higher amounts for expenses than the amounts of cash payments or lower amounts for revenues than the amounts of cash receipts • Decrease in current operating assets (e.g., accounts receivable, inventory, and prepaid expenses) • Increase in current operating liabilities (e.g., accounts payable and accrued expense liabilities)
Subtractions	▪ Non-cash items (e.g., amortization of bond premium)

- Non-operating items
 - Gain on sale of assets
 - Gain on retirement of debt
 - Income on investments accounted for under the equity method
- Decrease in deferred income tax liability
- Changes in working capital resulting from accruing lower amounts for expenses than for cash payments or higher amounts for revenues than for cash receipts
 - Increase in current operating assets (e.g., accounts receivable, inventory, and prepaid expenses)
 - Decrease in current operating liabilities (e.g., accounts payable and accrued expense liabilities)

Accordingly, for Acme Corporation (using Exhibits 9 and 10), the USD55 increase in accounts receivable and the USD707 increase in inventory are subtracted from net income and the USD23 decrease in prepaid expenses is added to net income. For Acme's current liabilities, the increases in accounts payable, salary and wage payable, income tax payable, and other accrued liabilities (USD263, USD10, USD5, and USD22, respectively) are added to net income and the USD12 decrease in interest payable is subtracted from net income. Exhibit 25 presents the cash flow statement for Acme Corporation under the indirect method using the information that we have determined from our analysis of the income statement and the comparative balance sheets. Note that the investing and financing sections are identical to the statement of cash flows prepared using the direct method.

**Exhibit 25: Acme Corporation Cash Flow Statement
(Indirect Method) Year Ended 31 December 2018**

Cash flow from operating activities:	
Net income	USD2,210
Depreciation expense	1,052
Gain on sale of equipment	(205)
Increase in accounts receivable	(55)
Increase in inventory	(707)
Decrease in prepaid expenses	23
Increase in accounts payable	263
Increase in salary and wage payable	10
Decrease in interest payable	(12)
Increase in income tax payable	5

Cash flow from operating activities:	
Increase in other accrued liabilities	22
Net cash provided by operating activities	2,606
Cash flow from investing activities:	
Cash received from sale of equipment	762
Cash paid for purchase of equipment	(1,300)
Net cash used for investing activities	(538)
Cash flow from financing activities:	
Cash paid to retire long-term debt	(500)
Cash paid to retire common stock	(600)
Cash paid for dividends	(1,120)
Net cash used for financing activities	(2,220)
Net decrease in cash	(152)
Cash balance, 31 December 2017	1,163
Cash balance, 31 December 2018	USD1,011

5

CONVERSION FROM THE INDIRECT TO DIRECT METHOD



demonstrate the conversion of cash flows from the indirect to direct method

An analyst may desire to review direct-format operating cash flow to review trends in cash receipts and payments (such as cash received from customers or cash paid to suppliers). If a direct-format statement is not available, cash flows from operating activities reported under the indirect method can be converted to the direct method. Accuracy of conversion depends on adjustments using data available in published financial reports. The method described in this lesson is sufficiently accurate for most analytical purposes.

Method to Convert Cash Flow from Indirect to Direct

The three-step conversion process is demonstrated for Acme Corporation in Exhibit 26. Referring again to Exhibits 9 and 10 for Acme Corporation's income statement and balance sheet information, begin by disaggregating net income of USD2,210 into total revenues and total expenses (Step 1). Next, remove any non-operating and non-cash items (Step 2). For Acme, we therefore remove the non-operating gain on the sale of equipment of USD205 and the non-cash depreciation expense of USD1,052. Then, convert accrual amounts of revenues and expenses to cash flow amounts of receipts and payments by adjusting for changes in working capital accounts (Step 3). The results of these adjustments are the items of information for the direct format of operating cash flows. These line items are shown as the results of Step 3.

Exhibit 26: Conversion from the Indirect to the Direct Method

<i>Step 1</i>	Total revenues	USD23,803
Aggregate all revenue and all expenses	Total expenses	21,593
	Net income	USD2,210
<i>Step 2</i>	Total revenue less noncash item revenues:	
Remove all noncash items from aggregated revenues and expenses and break out remaining items into relevant cash flow items	(USD23,803 – USD205) =	USD23,598
	Revenue	USD23,598
	Total expenses less noncash item expenses:	
	(USD21,593 – USD1,052) =	USD20,541
	Cost of goods sold	USD11,456
	Salary and wage expenses	4,123
	Other operating expenses	3,577
	Interest expense	246
	Income tax expense	1,139
	Total	USD20,541
<i>Step 3</i>	Cash received from customers ^a	USD23,543
Convert accrual amounts to cash flow amounts by adjusting for working capital changes	Cash paid to suppliers ^b	(11,900)
	Cash paid to employees ^c	(4,113)
	Cash paid for other operating expenses ^d	(3,532)
	Cash paid for interest ^e	(258)
	Cash paid for income tax ^f	(1,134)
	Net cash provided by operating activities	USD2,606

Calculations for Step 3:

^aRevenue of \$23,598 less increase in accounts receivable of \$55.

^bCost of goods sold of \$11,456 plus increase in inventory of \$707 less increase in accounts payable of \$263.

^cSalary and wage expense of \$4,123 less increase in salary and wage payable of \$10.

^dOther operating expenses of \$3,577 less decrease in prepaid expenses of \$23 less increase in other accrued liabilities of \$22.

^eInterest expense of \$246 plus decrease in interest payable of \$12.

^fIncome tax expense of \$1,139 less increase in income tax payable of \$5.

CASH FLOWS FROM INVESTING ACTIVITIES**6**

describe the steps in the preparation of direct and indirect cash flow statements, including how cash flows can be computed using income statement and balance sheet data

The second and third steps in preparing the cash flow statement are to determine the total cash flows from investing activities and from financing activities. The presentation of this information is identical, regardless of whether the direct or indirect method is used for operating cash flows.

Cash Flows from Investing Activities

Purchases and sales of equipment were the only investing activities undertaken by Acme in 2018, as evidenced by the fact that the amounts reported for land and buildings were unchanged during the year. An informational note in Exhibit 10 tells us that Acme *purchased* new equipment in 2018 for a total cost of USD1,300. However, the amount of equipment shown on Acme's balance sheet increased by only USD243 (ending balance of USD8,798 minus beginning balance of USD8,555); therefore, Acme must have also *sold or otherwise disposed of* some equipment during the year. To determine the cash inflow from the sale of equipment, we analyze the equipment and accumulated depreciation accounts as well as the gain on the sale of equipment from Exhibits 9 and 10. Assuming that the entire accumulated depreciation is related to equipment, the cash received from sale of equipment is determined as follows.

The historical cost of the equipment sold was USD1,057. This amount is determined as shown in Exhibit 27:

Exhibit 27: Cost of Equipment Sold

Beginning balance equipment (from balance sheet)	USD8,555
Plus equipment purchased (from informational note)	1,300
Minus ending balance equipment (from balance sheet)	(8,798)
Equals historical cost of equipment sold	USD1,057

The accumulated depreciation on the equipment sold was USD500, determined as shown in Exhibit 28:

Exhibit 28: Accumulated Depreciation

Beginning balance accumulated depreciation (from balance sheet)	USD2,891
Plus depreciation expense (from income statement)	1,052
Minus ending balance accumulated depreciation (from balance sheet)	(3,443)
Equals accumulated depreciation on equipment sold	USD500

The historical cost information, accumulated depreciation information, and information from the income statement about the gain on the sale of equipment can be used to determine the cash received from the sale, as shown in Exhibit 29:

Exhibit 29: Cash Received from the Sale

Historical cost of equipment sold (calculated above)	USD1,057
Less accumulated depreciation on equipment sold (calculated above)	(500)
Equals book value of equipment sold	USD557

Plus gain on sale of equipment (from the income statement)

205

Equals cash received from sale of equipment

USD762

QUESTION SET

1. Copper, Inc., a fictitious brewery and restaurant chain, reported a gain on the sale of equipment of USD12 million. In addition, the company's income statement shows depreciation expense of USD8 million and the cash flow statement shows capital expenditure of USD15 million, all of which was for the purchase of new equipment.

Exhibit 30: Copper Inc.

Balance sheet item	31 December 2017	31 December 2018	Change
Equipment	USD100 million	USD109 million	USD9 million
Accumulated depreciation—equipment	USD30 million	USD36 million	USD6 million

Using the information in Exhibit 30 from the comparative balance sheets, how much cash did the company receive from the equipment sale?

- A. USD12 million
- B. USD16 million
- C. USD18 million

Solution:

B is correct. Selling price (cash inflow) minus book value equals gain or loss on sale; therefore, gain or loss on sale plus book value equals selling price (cash inflow). The amount of gain is given, USD12 million. To calculate the book value of the equipment sold, find the historical cost of the equipment and the accumulated depreciation on the equipment.

- Beginning balance of equipment of USD100 million plus equipment purchased of USD15 million minus ending balance of equipment of USD109 million equals historical cost of equipment sold, or USD6 million.
- Beginning accumulated depreciation on equipment of USD30 million plus depreciation expense for the year of USD8 million minus ending balance of accumulated depreciation of USD36 million equals accumulated depreciation on the equipment sold, or USD2 million.
- Therefore, the book value of the equipment sold was USD6 million minus USD2 million, or USD4 million.
- Because the gain on the sale of equipment was USD12 million, the amount of cash received must have been USD16 million.

2. Silverago Incorporated, an international metals company, reported a loss on the sale of equipment of USD2 million in 2018. In addition, the company's income statement shows depreciation expense of USD8 million and the cash

flow statement shows capital expenditure of USD10 million, all of which was for the purchase of new equipment. Using the information in Exhibit 31 from the comparative balance sheets, how much cash did the company receive from the equipment sale?

Exhibit 31: Silverago Inc.

Balance Sheet Item	31 December 2017	31 December 2018	Change
Equipment	USD100 million	USD105 million	USD5 million
Accumulated depreciation— equipment	USD40 million	USD46 million	USD6 million

- A. USD1 million
- B. USD2 million
- C. USD3 million

Solution:

A is correct. Selling price (cash inflow) minus book value equals gain or loss on sale; therefore, gain or loss on sale plus book value equals selling price (cash inflow). The amount of loss is given—USD2 million. To calculate the book value of the equipment sold, find the historical cost of the equipment and the accumulated depreciation on the equipment.

- Beginning balance of equipment of USD100 million plus equipment purchased of USD10 million minus ending balance of equipment of USD105 million equals the historical cost of equipment sold, or USD5 million.
- Beginning accumulated depreciation of USD40 million plus depreciation expense for the year of USD8 million minus ending balance of accumulated depreciation of USD46 million equals accumulated depreciation on the equipment sold, or USD2 million.
- Therefore, the book value of the equipment sold was USD5 million minus USD2 million, or USD3 million.
- Because the loss on the sale of equipment was USD2 million, the amount of cash received must have been USD1 million.

7

CASH FLOWS FROM FINANCING ACTIVITIES



describe the steps in the preparation of direct and indirect cash flow statements, including how cash flows can be computed using income statement and balance sheet data

As with investing activities, the presentation of financing activities is identical, regardless of whether the direct or indirect method is used for operating cash flows.

Cash Flow from Financing activities: Long-Term Debt and Common Stock

The change in long-term debt, based on the beginning 2018 (ending 2017) and ending 2018 balances in [Exhibit 10](#), was a decrease of USD500. Absent other information, this indicates that Acme retired USD500 of long-term debt. Retiring long-term debt is a cash outflow relating to financing activities.

Similarly, the change in common stock during 2018 was a decrease of USD600. Absent other information, this indicates that Acme repurchased USD600 of its common stock. Repurchase of common stock is also a cash outflow related to financing activity.

Computing Dividends Paid

Recall the following relationship:

$$\text{Beginning retained earnings} + \text{Net income} - \text{Dividends} = \text{Ending retained earnings}$$

Based on this relationship, the amount of cash dividends paid in 2018 can be determined from an analysis of retained earnings, as shown in [Exhibit 32](#).

Exhibit 32: Analysis of Retained Earnings

Beginning balance of retained earnings (from the balance sheet)	USD2,876
Plus net income (from the income statement)	2,210
Minus ending balance of retained earnings (from the balance sheet)	(3,966)
Equals dividends paid	USD1,120

Note that dividends paid are presented in the statement of changes in equity.

EXAMPLE 8

Computing Cash Flow from Financing Activity

1. Jaderong Plinkett Stores reported net income of USD25 million. The company has no outstanding debt. Using the information in [Exhibit 33](#) from the comparative balance sheets (in millions), what should the company report in the financing section of the statement of cash flows in 2018?

Exhibit 33: Jaderong Plinkett Stores

Balance Sheet Item	31 December 2017	31 December 2018	Change
Common stock	USD100	USD102	USD2
Additional paid-in capital common stock	USD100	USD140	USD40
Retained earnings	USD100	USD115	USD15
Total stockholders' equity	USD300	USD357	USD57

- A. Issuance of common stock of USD42 million; dividends paid of USD10 million

- B.** Issuance of common stock of USD38 million; dividends paid of USD10 million
- C.** Issuance of common stock of USD42 million; dividends paid of USD40 million

Solution:

A is correct. The increase of USD42 million in common stock and additional paid-in capital indicates that the company issued stock during the year. The increase in retained earnings of USD15 million indicates that the company paid USD10 million in cash dividends during the year, determined as beginning retained earnings of USD100 million plus net income of USD25 million minus ending retained earnings of USD115 million, which equals USD10 million in cash dividends.

8

DIFFERENCES IN CASH FLOW STATEMENTS PREPARED UNDER US GAAP VERSUS IFRS



contrast cash flow statements prepared under International Financial Reporting Standards (IFRS) and US generally accepted accounting principles (US GAAP)

The key differences between statements of cash flows prepared under IFRS and US GAAP are summarized in Exhibit 34. Most significantly, IFRS allow more flexibility in the reporting of such items as interest paid or received and dividends paid or received and in how income tax expense is classified.

US GAAP classify interest and dividends received from investments as operating activities, whereas IFRS allow companies to classify those items as either operating or investing cash flows. Likewise, US GAAP classify interest expense as an operating activity, even though the principal amount of the debt issued is classified as a financing activity. IFRS allow companies to classify interest expense as either an operating activity or a financing activity. US GAAP classify dividends paid to stockholders as a financing activity, whereas IFRS allow companies to classify dividends paid as either an operating activity or a financing activity.

US GAAP classify all income tax expenses as an operating activity. IFRS also classify income tax expense as an operating activity, unless the tax expense can be specifically identified with an investing or financing activity (e.g., the tax effect of the sale of a discontinued operation could be classified under investing activities).

Exhibit 34: Cash Flow Statements: Differences between IFRS and US GAAP

Topic	IFRS	US GAAP
Classification of cash flows:		
• Interest received	Operating or investing	Operating
• Interest paid	Operating or financing	Operating
• Dividends received	Operating or investing	Operating
• Dividends paid	Operating or financing	Financing

Topic	IFRS	US GAAP
• Bank overdrafts	Considered part of cash equivalents	Not considered part of cash and cash equivalents and classified as financing
• Taxes paid	Generally operating, but a portion can be allocated to investing or financing if it can be specifically identified with these categories	Operating
Format of statement:	Direct or indirect; direct is encouraged	Direct or indirect; direct is encouraged. A reconciliation of net income to cash flow from operating activities must be provided regardless of method used

Sources: IAS 7; FASB ASC Topic 230; and "IFRS and US GAAP: Similarities and Differences," PricewaterhouseCoopers (November 2017), available at www.pwc.com.

QUESTION SET



1. Which of the following is an example of a financing activity on the cash flow statement under US GAAP?

- A. Payment of interest
- B. Receipt of dividends
- C. Payment of dividends

Solution:

C is correct. Payment of dividends is a financing activity under US GAAP. Payment of interest and receipt of dividends are included in operating cash flows under US GAAP. Note that IFRS allow companies to include receipt of interest and dividends as either operating or investing cash flows and to include payment of interest and dividends as either operating or financing cash flows.

2. Interest paid is classified as an operating cash flow under:

- A. US GAAP but may be classified as either operating or investing cash flows under IFRS.
- B. IFRS but may be classified as either operating or investing cash flows under US GAAP.
- C. US GAAP but may be classified as either operating or financing cash flows under IFRS.

Solution:

C is correct. Interest expense is always classified as an operating cash flow under US GAAP but may be classified as either an operating or financing cash flow under IFRS.

3. Cash flows from taxes on income must be separately disclosed under:

- A. IFRS only.
- B. US GAAP only.

C. both IFRS and US GAAP.

Solution:

C is correct. Taxes on income are required to be separately disclosed under IFRS and US GAAP. The disclosure may be in the cash flow statement or elsewhere.

4. Mabel Corporation (MC) reported accounts receivable of USD66 million at the end of its second fiscal quarter. MC had revenues of USD72 million for its third fiscal quarter and reported accounts receivable of USD55 million at the end of its third fiscal quarter. Based on this information, the amount of cash MC collected from customers during the third fiscal quarter is:

A. USD61 million.

B. USD72 million.

C. USD83 million.

Solution:

C is correct. The amount of cash collected from customers during the quarter is equal to beginning accounts receivable plus revenues minus ending accounts receivable: $\text{USD66 million} + \text{USD72 million} - \text{USD55 million} = \text{USD83 million}$. A reduction in accounts receivable indicates that cash collected during the quarter was greater than revenue on an accrual basis.

5. Red Road Company, a consulting company, reported total revenues of USD100 million, total expenses of USD80 million, and net income of USD20 million in the most recent year. If accounts receivable increased by USD10 million, how much cash did the company receive from customers?

A. USD90 million.

B. USD100 million.

C. USD110 million.

Solution:

A is correct. Revenues of USD100 million minus the increase in accounts receivable of USD10 million equal USD90 million cash received from customers. The increase in accounts receivable means that the company received less in cash than it reported as revenue.

PRACTICE PROBLEMS

- Based on the information in Exhibit 1 for Pinkerly Inc., a fictitious company, what are the total adjustments that the company would make to net income in order to derive operating cash flow?

Exhibit 1: Pinkerly Inc.

Year Ended			
Income statement item	12/31/2018		
Net income	USD30 million		
Depreciation	USD7 million		
Balance sheet item	12/31/2017	12/31/2018	Change
Accounts receivable	USD15 million	USD30 million	USD15 million
Inventory	USD16 million	USD13 million	(USD3 million)
Accounts payable	USD10 million	USD20 million	USD10 million

- Add USD5 million
 - Add USD21 million
 - Subtract USD9 million
- When computing net cash flow from operating activities using the indirect method, an addition to net income is *most likely* to occur when there is a:
 - gain on the sale of an asset.
 - loss on the retirement of debt.
 - decrease in a deferred tax liability.
 - An analyst gathered the information in Exhibit 1 from a company's 2018 financial statements:

Exhibit 1: 2018 Financial Statement (US dollars, millions)

Balances as of Year Ended 31 December	2017	2018
Retained earnings	120	145
Accounts receivable	38	43
Inventory	45	48
Accounts payable	36	29

In 2018, the company declared and paid cash dividends of USD10 million and recorded depreciation expense in the amount of USD25 million. The company considers dividends paid a financing activity. The company's 2018 cash flow from operations (in USD millions) was *closest* to:

- 25.

- B. 45.
- C. 75.
4. Based on the information in Exhibit 1 for Star Inc., what are the total net adjustments that the company would make to net income to derive operating cash flow?

Exhibit 1: Star Inc.

Year Ended			
Income Statement Item		12/31/2018	
Net income		USD20 million	
Depreciation		USD2 million	
Balance Sheet Item	12/31/2017	12/31/2018	Change
Accounts receivable	USD25 million	USD22 million	(USD3 million)
Inventory	USD10 million	USD14 million	USD4 million
Accounts payable	USD8 million	USD13 million	USD5 million

- A. Add USD2 million
- B. Add USD6 million
- C. Subtract USD6 million.
5. In 2018, a company using US GAAP made cash payments of USD6 million for salaries, USD2 million for interest expense, and USD4 million for income taxes. Additional information for the company is provided in the Exhibit 1:

Exhibit 1: Cash Payments

(US dollars, millions)	2017	2018
Revenue	42	37
Cost of goods sold	18	16
Inventory	36	40
Accounts receivable	22	19
Accounts payable	14	12

Based only on the information in Exhibit 1, the company's operating cash flow for 2018 is *closest to*:

- A. USD6 million.
- B. USD10 million.
- C. USD14 million.
6. Green Glory Corp., a garden supply wholesaler, reported cost of goods sold for the year of USD80 million. Total assets increased by USD55 million, including an increase of USD5 million in inventory. Total liabilities increased by USD45

million, including an increase of USD2 million in accounts payable. The cash paid by the company to its suppliers is most likely *closest* to:

- A. USD73 million.
 - B. USD77 million.
 - C. USD83 million.
7. Purple Fleur S.A., a retailer of floral products, reported cost of goods sold for the year of USD75 million. Total assets increased by USD55 million, but inventory declined by USD6 million. Total liabilities increased by USD45 million, and accounts payable increased by USD2 million. The cash paid by the company to its suppliers is most likely *closest* to:
- A. USD67 million.
 - B. USD79 million.
 - C. USD83 million.
8. White Flag, a women's clothing manufacturer, reported salaries expense of USD20 million. The beginning balance of salaries payable was USD3 million, and the ending balance of salaries payable was USD1 million. How much cash did the company pay in salaries?
- A. USD18 million
 - B. USD21 million
 - C. USD22 million
9. An analyst gathered the information in Exhibit 1 from a company's 2018 financial statements:

Exhibit 1: 2018 Financial Statements (US dollars, millions)

Year ended 31 December	2017	2018
Net sales	245.8	254.6
Cost of goods sold	168.3	175.9
Accounts receivable	73.2	68.3
Inventory	39.0	47.8
Accounts payable	20.3	22.9

Based only on the information in Exhibit 1, the company's 2018 statement of cash flows in the direct format would include amounts (in US dollars millions) for cash received from customers and cash paid to suppliers, respectively, that are *closest* to:

	Cash received from customers	Cash paid to suppliers
A.	249.7	169.7
B.	259.5	174.5
C.	259.5	182.1

10. Golden Cumulus Corp., a commodities trading company, reported interest expense of USD19 million and taxes of USD6 million. Interest payable increased by USD3 million, and taxes payable decreased by USD4 million over the period. How much cash did the company pay for interest and taxes?
- A. USD22 million for interest and USD10 million for taxes
 - B. USD16 million for interest and USD2 million for taxes
 - C. USD16 million for interest and USD10 million for taxes
11. The information in Exhibit 1 is extracted from Sweetfall Incorporated's financial statements.

Exhibit 1: Sweetfall Inc.

Income Statement		Balance Sheet Changes	
Revenue	USD56,800	Decrease in accounts receivable	USD1,324
Cost of goods sold	27,264	Decrease in inventory	501
Other operating expense	562	Increase in prepaid expense	6
Depreciation expense	2,500	Increase in accounts payable	1,063

The amount of cash Sweetfall Inc. paid to suppliers is:

- A. USD25,700.
- B. USD26,702.
- C. USD27,826.



SOLUTIONS

1. A is correct. To derive operating cash flow, the company would make the following adjustments to net income: add depreciation (a non-cash expense) of USD7 million; add the decrease in inventory of USD3 million; add the increase in accounts payable of USD10 million; and subtract the increase in accounts receivable of USD15 million. Total additions of USD20 million and total subtractions of USD15 million result in net total additions of USD5 million.
2. B is correct. An addition to net income is made when there is a loss on the retirement of debt, which is a non-operating loss. A gain on the sale of an asset and a decrease in deferred tax liability are both subtracted from net-income.
3. B is correct. All dollar amounts are in millions. Net income (NI) for 2018 is USD35. This amount is the increase in retained earnings, USD25, plus the dividends paid, USD10. Depreciation of USD25 is added back to net income, and the increases in accounts receivable, USD5, and in inventory, USD3, are subtracted from net income because they are uses of cash. The decrease in accounts payable is also a use of cash and, therefore, a subtraction from net income. Thus, cash flow from operations is $\text{USD}25 + \text{USD}10 + \text{USD}25 - \text{USD}5 - \text{USD}3 - \text{USD}7 = \text{USD}45$.
4. B is correct. To derive operating cash flow, the company would make the following adjustments to net income: Add depreciation (a non-cash expense) of USD2 million; add the decrease in accounts receivable of USD3 million; add the increase in accounts payable of USD5 million; and subtract the increase in inventory of USD4 million. Total additions would be USD10 million, and total subtractions would be USD4 million, which gives net additions of USD6 million.

5. A is correct.

Operating cash flows

= Cash received from customers – (Cash paid to suppliers + Cash paid to employees + Cash paid for other operating expenses + Cash paid for interest + Cash paid for income taxes)

Cash received from customers = Revenue + Decrease in accounts receivable

= $\text{USD}37 + \text{USD}3 = \text{USD}40$ million

Cash paid to suppliers

= Cost of goods sold + Increase in inventory + Decrease in accounts payable

= $\text{USD}16 + \text{USD}4 + \text{USD}2 = \text{USD}22$ million

Therefore, the company's operating cash flow = $\text{USD}40 - \text{USD}22 - \text{Cash paid for salaries} - \text{Cash paid for interest} - \text{Cash paid for taxes} = \text{USD}40 - \text{USD}22 - \text{USD}6 - \text{USD}2 - \text{USD}4 = \text{USD}6$ million.

6. C is correct. Cost of goods sold of USD80 million plus the increase in inventory of USD5 million equals purchases from suppliers of USD85 million. The increase in accounts payable of USD2 million means that the company paid USD83 million in cash (USD85 million minus USD2 million) to its suppliers.
7. A is correct. Cost of goods sold of USD75 million less the decrease in inventory of USD6 million equals purchases from suppliers of USD69 million. The increase

in accounts payable of USD2 million means that the company paid USD67 million in cash (USD69 million minus USD2 million).

8. C is correct. Beginning salaries payable of USD3 million plus salaries expense of USD20 million minus ending salaries payable of USD1 million equals USD22 million. Alternatively, the expense of USD20 million plus the USD2 million decrease in salaries payable equals USD22 million.
9. C is correct. Cash received from customers = Sales + Decrease in accounts receivable = $254.6 + 4.9 = 259.5$. Cash paid to suppliers = Cost of goods sold + Increase in inventory – Increase in accounts payable = $175.9 + 8.8 - 2.6 = 182.1$.
10. C is correct. Interest expense of USD19 million less the increase in interest payable of USD3 million equals interest paid of USD16 million. Tax expense of USD6 million plus the decrease in taxes payable of USD4 million equals taxes paid of USD10 million.
11. A is correct. The amount of cash paid to suppliers is calculated as follows:
= Cost of goods sold – Decrease in inventory – Increase in accounts payable
= $\text{USD}27,264 - \text{USD}501 - \text{USD}1,063$
= $\text{USD}25,700$.

LEARNING MODULE

5

Analyzing Statements of Cash Flows II

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	analyze and interpret both reported and common-size cash flow statements
☐	calculate and interpret free cash flow to the firm, free cash flow to equity, and performance and coverage cash flow ratios

INTRODUCTION

1

An analysis of a company's statement of cash flows provides crucial information for evaluating a company's financial position and for forecasting its future cash flows, which is foundational to the valuation of the company's debt and equity securities. This module discusses tools and techniques for analyzing the statement of cash flows, including the analysis of sources and uses of cash and cash flow, common-size analysis, and the calculation of free cash flow measures and cash flow ratios.

LEARNING MODULE OVERVIEW



- An evaluation of a cash flow statement involves an assessment of the sources and uses of cash and the main drivers of cash flow within operating, investing, and financing activities.
- Analyst can use common-size statement analysis for the cash flow statement by expressing cash flow items as a percentage of total cash inflows/total cash outflows or as a percentage of net revenues.
- The cash flow statement can be used to calculate free cash flow to the firm (FCFF) and free cash flow to equity (FCFE), which are important profit measures for investors.
- The cash flow statement may also be used to calculate financial ratios that measure a company's profitability, performance, and financial position. Analysts use these ratios to evaluate the company over time and to compare multiple companies.

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

2

EVALUATING SOURCES AND USES OF CASH



analyze and interpret both reported and common-size cash flow statements

Evaluation of the cash flow statement should involve an overall assessment of the sources and uses of cash between the three main categories as well as an assessment of the main drivers of cash flow within each category, as follows:

- Step 1 Evaluate the major sources and uses of cash flow, including operating, investing, and financing activities.
- Step 2 Evaluate the primary determinants of operating cash flow.
- Step 3 Evaluate the primary determinants of investing cash flow.
- Step 4 Evaluate the primary determinants of financing cash flow.

Step 1. Evaluate the major sources and uses of cash flow

The major sources of cash for a company can vary with its stage of growth. For a mature company, it is expected and desirable that operating activities are the primary source of cash flows. Over the long term, a company must generate cash from its operating activities. If operating cash flow were consistently negative, a company would need to borrow money or issue stock (financing activities) to fund the shortfall. Eventually, these providers of capital need to be repaid from operations or they will no longer be willing to provide capital. Cash generated from operating activities can be used in either investing or financing activities. If the company has value-creative investment opportunities, it is desirable to use the cash in investing activities. If the company does not have profitable investment opportunities, the cash should be returned to capital providers, a financing activity.

For a new or growth stage company, operating cash flow may be negative for some period of time as it invests in such assets as inventory and receivables (extending credit to new customers) to grow the business. This situation is not sustainable over the long term, so eventually the cash must start to come primarily from operating activities so that capital can be returned to the providers of capital. Lastly, it is desirable that operating cash flows are sufficient to cover capital expenditures (in other words, the company has free cash flow as discussed further in Lesson 3). In summary, major points to consider at this step are:

- What are the major sources and uses of cash flow?
- Is operating cash flow positive and sufficient to cover capital expenditures?

Step 2. Evaluate the primary determinants of operating cash flow

Turning to the operating section, analysts should examine the most significant determinants of operating cash flow. Companies need cash for use in operations (e.g., to hold receivables and inventory and to pay employees and suppliers) and receive cash from operating activities (e.g., payments from customers). Increases and decreases in receivables, inventory, payables, and so on can be examined to determine whether the company is using or generating cash in operations and why.

It is also useful to compare operating cash flow with net income. For a mature company, because net income includes non-cash expenses (depreciation and amortization), it is expected and desirable that operating cash flow exceeds net income. The relationship between net income and operating cash flow is also an indicator of earnings quality. If a company has large net income but poor operating cash flow, it may be a sign of poor earnings quality. The company may be making aggressive accounting choices to increase net income but may not be generating cash for its business. Analysts also should examine the variability of both earnings and cash flow and consider the impact of this variability on the company's risk as well as the ability to forecast future cash flows for valuation purposes. In summary:

- What are the major determinants of operating cash flow?
- Is operating cash flow higher or lower than net income? Why?
- How consistent are operating cash flows?

Step 3. Evaluate the primary determinants of investing cash flow

Within the investing section, analysts should evaluate each line item. Each line item represents either a source or use of cash. This enables analysts to understand where the cash is being spent (or received). This section will reveal how much cash is being invested for the future in property, plant, and equipment; how much is used to acquire entire companies; and how much is put aside in liquid investments, such as stocks and bonds. It will also tell show how much cash is being raised by selling these types of assets. If the company is making major capital investments, analysts should consider where the cash is coming from to cover these investments (e.g., is the cash coming from excess operating cash flow or from the financing activities described in Step 4). If assets are being sold, it is important to determine why and to assess the effects on the company.

Step 4. Evaluate the primary determinants of financing cash flow

Within the financing section, analysts should examine each line item to understand whether the company is raising capital or repaying capital and what the nature of its capital sources are. If the company is borrowing each year, analysts should consider when repayment may be required. The financing section will also present dividend payments and repurchases of stock that are alternative means of returning capital to owners. It is important to assess why capital is being raised or repaid.

EXAMPLE 1

Analysis of the Cash Flow Statement

1. Derek Yee, CFA, is preparing to forecast cash flow for Groupe Danone as an input into his valuation model. He reviews the historical cash flow statement of Groupe Danon for 2016 and 2017, which is presented in Exhibit 1, and excerpts from Danone's 2017 Registration Document, which is presented in

Exhibit 2. Yee notes that Groupe Danone prepares its financial statements in conformity with International Financial Reporting Standards (IFRS).

**Exhibit 1: Groupe Danone Consolidated Financial Statements
Consolidated Statements of Cash Flows (in EUR millions)**

Years Ended 31 December	2016	2017
Net income	1,827	2,563
Share of profits of associates net of dividends received	52	(54)
Depreciation, amortization, and impairment of tangible and intangible assets	786	974
Increases in (reversals of) provisions	51	153
Change in deferred taxes	(65)	(353)
(Gains) losses on disposal of property, plant and equipment and financial investments	(74)	(284)
Expense related to group performance shares	24	22
Cost of net financial debt	149	265
Net interest paid	(148)	(186)
Net change in interest income (expense)	—	80
Other components with no cash impact	13	(15)
Cash flows provided by operating activities, before changes in net working capital	2,615	3,085
(Increase) decrease in inventories	(24)	(122)
(Increase) decrease in trade receivables	(110)	(190)
Increase (decrease) in trade payables	298	145
Changes in other receivables and payables	(127)	40
Change in other working capital requirements	37	(127)
Cash flows provided by (used in) operating activities	2,652	2,958
Capital expenditure	(925)	(969)
Proceeds from the disposal of property, plant, and equipment	27	45
Net cash outflows on purchases of subsidiaries and financial investments	(66)	(10,949)
Net cash inflows on disposal of subsidiaries and financial investments	110	441
(Increase) decrease in long-term loans and other long-term financial assets	6	(4)
Cash flows provided by (used in) investing activities	(848)	(11,437)
Increase in capital and additional paid-in capital	46	47
Purchases of treasury stock (net of disposals) and Danone call options	32	13
Issue of perpetual subordinated debt securities	—	1,245
Interest on perpetual subordinated debt securities	—	—
Dividends paid to Danone shareholders	(985)	(279)
Buyout of non-controlling interests	(295)	(107)
Dividends paid	(94)	(86)
Contribution from non-controlling interests to capital increases	6	1

Years Ended 31 December	2016	2017
Transactions with non-controlling interests	(383)	(193)
Net cash flows on hedging derivatives	50	(52)
Bonds issued during the period	11,237	—
Bonds repaid during the period	(638)	(1,487)
Net cash flows from other current and non-current financial debt	(442)	(564)
Net cash flows from short-term investments	(10,531)	9,559
Cash flows provided by (used in) financing activities	(1,616)	8,289
Effect of exchange rate and other changes	(151)	272
Increase (decrease) in cash and cash equivalents	38	81
Cash and cash equivalents at beginning of period	519	557
Cash and cash equivalents at end of period	557	638
Supplemental disclosures		
Income tax payments during the year	(891)	(1,116)

Note: the numbers in the consolidated statement of cash flows were derived straight from company filings; some sub-totals may not sum exactly due to rounding by the company.

Exhibit 2: Excerpt from Groupe Danone 2017 Registration Statement

Footnote 2 to the financial statements:

“On July 7, 2016, Danone announced the signing of an agreement to acquire The WhiteWave Foods Company (“WhiteWave”), the global leader in plant-based foods and beverages and organic produce. The acquisition in cash, for USD 56.25 per share, represented, as of the date of the agreement, a total enterprise value of approximately USD 12.5 billion, including debt and certain other WhiteWave liabilities. ...

“Acquisition expenses recognized in Danone’s consolidated financial statements totaled €51 million before tax, of which €48 million was recognized in 2016 in Other operating income (expense), with the balance recognized in 2017.

“WhiteWave’s contribution to 2017 consolidated sales totaled €2.7 billion. Had the transaction been completed on January 1, 2017, the Group’s 2017 consolidated sales would have been €25.7 billion, with recurring operating income of €3.6 billion.

“Meanwhile, integration expenses for the period totaled €91 million, recognized under Other operating income (expense).”

Overview of Activities:

“As part of its transformation plan aimed at ensuring a safe journey to deliver strong, profitable and sustainable growth, Danone set objectives for 2020 that include like-for-like sales growth between 4% and 5% a recurring operating margin of over 16% in 2020 ... Finally, Danone will continue to focus on growing its free cash flow, which will contribute to financial deleverage with an objective of a ratio of Net debt/EBITDA below 3x in 2020. Danone is committed to reaching a ROIC level around 12% in 2020.”

2. What are the major sources and uses of cash for Groupe Danone?

Solution:

The major categories of cash flows can be summarized as follows (in EUR millions):

	2016	2017
Cash flows provided by operating activities	2,652	2,958
Cash flows provided by (used in) investing activities	(848)	(11,437)
Cash flows provided by (used in) financing activities	(1,616)	8,289
Exchange rate effects on cash	(151)	272
Increase in cash	38	81

The primary source of cash for Groupe Danone in 2016 was operating activities of 2,652. During that year, the company spent 925 on capital expenditures, representing most of the outflow of 848 from investing activities. In 2017, however, the primary source of cash for Groupe Danone was from financing activities. The investing section shows significant use of cash in 2017 for purchase of subsidiaries within investing activities.

3. Is cash flow from operating activities sufficient to cover capital expenditures?

Solution:

Yes, in both 2016 and 2017, there was sufficient operating cash flow to cover usual capital expenditures.

4. What is the relationship between net income and cash flow from operating activities?

Solution:

In both years, operating cash flow exceeded net income. The fact that operating cash flow exceeds net income in both years is a positive sign.

5. What types of financing cash flows does Groupe Danone have?

Solution:

Footnotes disclose a major acquisition with an aggregate value of USD12.5 billion, some of which was funded through proceeds from an earlier bond issuance, which appears as a financing cash flow in the financing section for 2016.

3

RATIOS AND COMMON-SIZE ANALYSIS



calculate and interpret free cash flow to the firm, free cash flow to equity, and performance and coverage cash flow ratios

In common-size analysis of a company's income statement, each income and expense line item is expressed as a percentage of net revenues (net sales). For the common-size balance sheet, each asset, liability, and equity line item is expressed as a percentage

of total assets. The common-size cash flow statement has two alternative approaches. The first approach is to express each line item of cash inflow (outflow) as a percentage of total inflows (outflows) of cash, and the second approach is to express each line item as a percentage of net revenue. The common-size format makes it easier to see trends in cash flow rather than just looking at the total amount.

Consider the statement of cash flows for Acme Corporation in Exhibit 3. Exhibit 4 demonstrates the total cash inflows/total cash outflows common-size method for Acme Corporation. Under this approach, each of the cash inflows is expressed as a percentage of the total cash inflows, whereas each of the cash outflows is expressed as a percentage of the total cash outflows. In Panel A, Acme's common-size statement is based on a cash flow statement using the direct method of presenting operating cash flows. Operating cash inflows and outflows are separately presented on the cash flow statement, and therefore, the common-size cash flow statement shows each of these operating inflows (outflows) as a percentage of total inflows (outflows).

In Panel B of Exhibit 4, Acme's common-size statement is based on a cash flow statement using the indirect method of presenting operating cash flows. When a cash flow statement has been presented using the indirect method, operating cash inflows and outflows are not separately presented; therefore, the common-size cash flow statement shows only the net operating cash flow (net cash provided by or used in operating activities) as a percentage of total inflows or outflows, depending on whether the net amount was a cash inflow or outflow. Because Acme's net operating cash flow is positive, it is shown as a percentage of total inflows.

Exhibit 3: Acme Corporation Cash Flow Statement (Direct Method) for Year Ended 31 December 2018

Cash flow from operating activities:

Cash received from customers	\$23,543
Cash paid to suppliers	(11,900)
Cash paid to employees	(4,113)
Cash paid for other operating expenses	(3,532)
Cash paid for interest	(258)
Cash paid for income tax	(1,134)
Net cash provided by operating activities	2,606

Cash flow from investing activities:

Cash received from sale of equipment	762
Cash paid for purchase of equipment	(1,300)
Net cash used for investing activities	(538)

Cash flow from financing activities:

Cash paid to retire long-term debt	(500)
Cash paid to retire common stock	(600)
Cash paid for dividends	(1,120)
Net cash used for financing activities	(2,120)
Net increase (decrease) in cash	(152)
Cash balance, 31 December 2017	1,163
Cash balance, 31 December 2018	1,011

**Exhibit 4: Acme Corporation Common-Size Cash Flow Statement:
Percentage of Inflows/Outflows Approach**
Panel A. Direct Format for Cash Flow

Inflows		Percentage of Total Inflows
Receipts from customers	USD23,543	96.86%
Sale of equipment	762	3.14
Total	USD24,305	100.00%
Outflows		Percentage of Total Outflows
Payments to suppliers	USD11,900	48.66%
Payments to employees	4,113	16.82
Payments for other operating expenses	3,532	14.44
Payments for interest	258	1.05
Payments for income tax	1,134	4.64
Purchase of equipment	1,300	5.32
Retirement of long-term debt	500	2.04
Retirement of common stock	600	2.45
Dividend payments	1,120	4.58
Total	USD24,457	100.00%
Net increase (decrease) in cash	(USD152)	

Panel B. Indirect Format for Cash Flow

Inflows		Percentage of Total Inflows
Net cash provided by operating activities	USD2,606	77.38%
Sale of equipment	762	22.62
Total	USD3,368	100.00%
Outflows		Percentage of Total Outflows
Purchase of equipment	USD1,300	36.93%
Retirement of long-term debt	500	14.20
Retirement of common stock	600	17.05
Dividend payments	1,120	31.82
Total	USD3,520	100.00%
Net increase (decrease) in cash	(USD152)	

Exhibit 5 demonstrates the second method of common-sizing the statement of cash flows: the net revenue approach. Under the net revenue approach, each line item in the cash flow statement is shown as a percentage of net revenue. The common-size

statement in Exhibit 5 has been developed based on Acme's cash flow statement using the indirect method for operating cash flows and using net revenue (cash received from customers) for the company in 2018 of USD23,598 from Exhibit 3.

This method is also useful to the analyst in forecasting future cash flows because individual items in the common-size statement (e.g., depreciation, fixed capital expenditures, debt borrowing, and repayment) are expressed as a percentage of net revenue. Thus, once the analyst has forecasted revenue, the common-size statement provides a basis for forecasting cash flows for those items with an expected relation to net revenue.

Exhibit 5: Acme Corporation Common-Size Cash Flow Statement: Net Revenue Approach

		Percentage of Net Revenue
Cash flow from operating activities:		
Net income	USD2,210	9.37%
Depreciation expense	1,052	4.46
Gain on sale of equipment	(205)	(0.87)
Increase in accounts receivable	(55)	(0.23)
Increase in inventory	(707)	(3.00)
Decrease in prepaid expenses	23	0.10
Increase in accounts payable	263	1.11
Increase in salary and wage payable	10	0.04
Decrease in interest payable	(12)	(0.05)
Increase in income tax payable	5	0.02
Increase in other accrued liabilities	22	0.09
Net cash provided by operating activities	USD2,606	11.04%
Cash flow from investing activities:		
Cash received from sale of equipment	USD762	3.23%
Cash paid for purchase of equipment	(1,300)	(5.51)
Net cash used for investing activities	USD(538)	(2.28)%
Cash flow from financing activities:		
Cash paid to retire long-term debt	USD(500)	(2.12)%
Cash paid to retire common stock	(600)	(2.54)
Cash paid for dividends	(1,120)	(4.75)
Net cash used for financing activities	USD(2,220)	(9.41)%
Net decrease in cash	USD(152)	(0.64)%

EXAMPLE 2**Analysis of a Common-Size Cash Flow Statement**

1. Andrew Potter is examining an abbreviated common-size cash flow statement for Apple Inc., a multinational technology company. The common-size cash flow statement, presented in Exhibit 6, was prepared by dividing each line item by total net sales for the same year.

Exhibit 6: Apple Inc. Common-Size Statements of Cash Flows as Percentage of Total Net Sales

	12 Months Ended		
	30 September 2017	24 September 2016	26 September 2015
Statement of Cash Flows [Abstract]			
Operating activities:			
Net income	21.1%	21.2%	22.8%
Adjustments to reconcile net income to cash generated by operating activities:			
Depreciation and amortization	4.4%	4.9%	4.8%
Share-based compensation expense	2.1%	2.0%	1.5%
Deferred income tax expense	2.6%	2.3%	0.6%
Other	−0.1%	0.2%	0.2%
Changes in operating assets and liabilities:			
Accounts receivable, net	−0.9%	0.2%	0.2%
Inventories	−1.2%	0.1%	−0.1%
Vendor non-trade receivables	−1.9%	0.0%	−1.6%
Other current and non-current assets	−2.3%	0.5%	−0.1%
Accounts payable	4.2%	0.9%	2.1%
Deferred revenue	−0.3%	−0.7%	0.4%
Other current and non-current liabilities	−0.1%	−0.9%	3.9%
Cash generated by operating activities	27.7%	30.5%	34.8%
Investing activities:			
Purchases of marketable securities	−69.6%	−66.0%	−71.2%
Proceeds from maturities of marketable securities	13.9%	9.9%	6.2%
Proceeds from sales of marketable securities	41.3%	42.0%	46.0%
Payments made in connection with business acquisitions, net	−0.1%	−0.1%	−0.1%

	12 Months Ended		
	30 September 2017	24 September 2016	26 September 2015
Payments for acquisition of property, plant and equipment	−5.4%	−5.9%	−4.8%
Payments for acquisition of intangible assets	−0.2%	−0.4%	−0.1%
Payments for strategic investments, net	−0.2%	−0.6%	0.0%
Other	0.1%	−0.1%	0.0%
Cash used in investing activities	−20.3%	−21.3%	−24.1%
Financing activities:			
Proceeds from issuance of common stock	0.2%	0.2%	0.2%
Excess tax benefits from equity awards	0.3%	0.2%	0.3%
Payments for taxes related to net share settlement of equity awards	−0.8%	−0.7%	−0.6%
Payments for dividends and dividend equivalents	−5.6%	−5.6%	−4.9%
Repurchases of common stock	−14.4%	−13.8%	−15.1%
Proceeds from issuance of term debt, net	12.5%	11.6%	—
Repayments of term debt	−1.5%	−1.2%	0.0%
Change in commercial paper, net	1.7%	−0.2%	0.9%
Cash used in financing activities	−7.6%	−9.5%	−7.6%
Increase/(Decrease) in cash and cash equivalents	−0.1%	−0.3%	3.1%

2. Based on the information in Exhibit 6, discuss the trends in Apple's:

- A. depreciation and amortization expense.
- B. capital expenditures.

Solution:

- A. Apple's depreciation and amortization expense was consistently just less than 5 percent of total net revenue in 2015 and 2016, declining to 4.4 percent in 2017.
- B. Apple's level of capital expenditures is greater than its depreciation and amortization in 2016 and 2017, whereas it was at about the same level as depreciation and amortization in 2015. In 2017, capital expenditures approached 6 percent. This is an indication that Apple is doing

more than replacing property, plant, and equipment, and is expanding those investments. With cash generated from operating activities exceeding 27 percent of sales in every year, however, Apple has more than enough cash flow from operations to fund these expenditures.

3. Compare Apple's operating cash flow as a percentage of revenue with Apple's net profit margin.

Solution:

Apple's operating cash flow as a percentage of sales is much higher than net profit margin in every year. This gap appears to be declining however over the three-year period. In 2015 net profit margin was 22.8 percent, while operating cash flow as a percentage of sales was 34.8 percent. By 2017, the net profit margin declined slightly to 21.1 percent, while the operating cash flow as a percentage of sales declined more to 27.7 percent. The primary difference appears to have been an increase in the level of receivables and inventory purchases, somewhat offset by an increase in accounts payable.

4. Discuss Apple's use of its positive operating cash flow.

Solution:

Apple generated a large amount of operating cash flow each year, exceeding net income. This cash flow is used for relatively modest purchases of property, plant, and equipment, substantial purchases of marketable securities (investments), dividend payments and repurchases of its own stock.

4

FREE CASH FLOW MEASURES



calculate and interpret free cash flow to the firm, free cash flow to equity, and performance and coverage cash flow ratios

As noted earlier, it is desirable that operating cash flows are sufficient to cover capital expenditures. The excess of operating cash flow over capital expenditures is known generically as **free cash flow**. For purposes of valuing a company or its equity securities, an analyst may want to determine and use other cash flow measures, such as free cash flow to the firm (FCFF) or free cash flow to equity (FCFE).

FCFF is the cash flow available to both debt and equity investors after all operating expenses (including income taxes) have been paid and necessary investments in working capital and fixed capital have been made. FCFF can be computed starting with net income as follows:

$$\text{FCFF} = \text{NI} + \text{NCC} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv} - \text{WCInv}$$

where:

NI = Net income,

NCC = Non-cash charges (such as depreciation and amortization),

Int = Interest expense,

FCInv = Capital expenditures (fixed capital, such as equipment), and

WCInv = Working capital expenditures.

The reason for adding back interest is that FCFF is the cash flow available to the suppliers of debt capital as well as equity capital. Conveniently, FCFF can also be computed from cash flow from operating activities as follows

$$\text{FCFF} = \text{CFO} + \text{Int}(1 - \text{Tax rate}) - \text{FCInv}.$$

CFO represents cash flow from operating activities under US GAAP or under IFRS, where the company has included interest paid in operating activities. If interest paid was included in financing activities, then CFO does not have to be adjusted for $\text{Int}(1 - \text{Tax rate})$. Under IFRS, if the company has placed interest and dividends received in investing activities, these should be added back to CFO to determine FCFF. Additionally, if dividends paid were subtracted in the operating section, these should be added back in to compute FCFF.

Assuming a marginal tax rate of 34 percent for Acme in 2018, the computation of FCFF for Acme Corporation (based on the data from Exhibit 3) is shown in Exhibit 7.

Exhibit 7: FCFF for Acme Corporation

CFO	USD2,606
Plus: Interest paid times (1 – income tax rate)	
{USD258 [1 – 0.34] ^a }	170
Less: Net investments in fixed capital (USD1,300 – USD762)	(538)
FCFF	USD2,238

^aIncome tax rate of 0.34 = (Tax expense ÷ Pretax income) = (\$1,139 ÷ \$3,349).

FCFE is the cash flow available to the company's common stockholders after all operating expenses and borrowing costs (principal and interest) have been paid and necessary investments in working capital and fixed capital have been made. FCFE can be computed as follows:

$$\text{FCFE} = \text{CFO} - \text{FCInv} + \text{Net borrowing}.$$

When net borrowing is negative, debt repayments exceed receipts of borrowed funds. In this case, FCFE can be expressed as follows:

$$\text{FCFE} = \text{CFO} - \text{FCInv} - \text{Net debt repayment}.$$

The computation of FCFE for Acme Corporation (again, based on the data from Exhibit 3) is shown in Exhibit 8.

Exhibit 8: FCFE for Acme Corporation

CFO	USD2,606
Less: Net investments in fixed capital (USD1,300 – USD762)	(538)
Less: Debt repayment	(500)
FCFE	USD1,568

Positive FCFE means that the company has an excess of operating cash flow over amounts needed for capital expenditures and repayment of debt. This cash would be available for distribution to owners.

5**CASH FLOW STATEMENT ANALYSIS: CASH FLOW RATIOS**

calculate and interpret free cash flow to the firm, free cash flow to equity, and performance and coverage cash flow ratios

Ratios based on information in statements of cash flows can be used to compare the performance and prospects of different companies in an industry and of different industries. These ratios generally fall into cash flow performance (profitability) ratios and cash flow coverage (solvency) ratios. Exhibit 9 summarizes the calculation and interpretation of some of these ratios.

Exhibit 9: Cash Flow Ratios

Performance Ratios	Calculation	What It Measures
Cash flow to revenue	$\text{CFO} \div \text{Net revenue}$	Operating cash generated per dollar of revenue
Cash return on assets	$\text{CFO} \div \text{Average total assets}$	Operating cash generated per dollar of asset investment
Cash return on equity	$\text{CFO} \div \text{Average shareholders' equity}$	Operating cash generated per dollar of owner investment
Cash to income	$\text{CFO} \div \text{Operating income}$	Cash generating ability of operations
Cash flow per share ^a	$(\text{CFO} - \text{Preferred dividends}) \div \text{Number of common shares outstanding}$	Operating cash flow on a per-share basis
Coverage Ratios	Calculation	What It Measures
Debt coverage	$\text{CFO} \div \text{Total debt}$	Financial risk and financial leverage
Interest coverage ^b	$(\text{CFO} + \text{Interest paid} + \text{Taxes paid}) \div \text{Interest paid}$	Ability to meet interest obligations
Reinvestment	$\text{CFO} \div \text{Cash paid for long-term assets}$	Ability to acquire assets with operating cash flows
Debt payment	$\text{CFO} \div \text{Cash paid for long-term debt repayment}$	Ability to pay debts with operating cash flows

Coverage Ratios	Calculation	What It Measures
Dividend payment	$\text{CFO} \div \text{Dividends paid}$	Ability to pay dividends with operating cash flows
Investing and financing	$\text{CFO} \div \text{Cash outflows for investing and financing activities}$	Ability to acquire assets, pay debts, and make distributions to owners

Notes:

^a If the company reports under IFRS and includes total dividends paid as a use of cash in the operating section, total dividends should be added back to CFO as reported and then preferred dividends should be subtracted. Recall that CFO reported under US GAAP and IFRS may differ depending on the treatment of interest and dividends, received and paid.

^b If the company reports under IFRS and included interest paid as a use of cash in the financing section, then interest paid should not be added back to the numerator.

EXAMPLE 3

A Cash Flow Analysis of Comparables

1. Andrew Potter is analyzing operating cash flow trends for Microsoft and Apple, which are presented in Exhibits 10 and 11.

Exhibit 10: Cash Flow from Operating Activities as a Percentage of Total Net Revenue

	2017	2016	2015
Microsoft	43.9%	39.1%	31.7%
Apple Inc.	27.7%	30.5%	34.8%

Exhibit 11: Cash Flow from Operating Activities as a Percentage of Average Total Assets

	2017	2016	2015
Microsoft	18.2%	18.1%	17.1%
Apple Inc.	18.2%	21.5%	31.1%

What is Potter *most likely* to conclude about the relative operating cash-flow-generating ability of these two companies?

Solution:

On both measures—operating cash flow divided by revenue and operating cash flow divided by assets—both companies have overall strong results. However, Microsoft has higher cash flow from operating activities as a percentage of revenues in both 2016 and 2017. Further, Microsoft has an increasing trend. While Apple had a higher operating cash flow as a percent of revenue in 2015 compared to Microsoft, it has had a declining trend and was below Microsoft in the two more recent years. Microsoft's operating cash flow relative to assets is the same as Apple's in 2017 and relatively stable with a slight increase since 2015. Apple started the three years with

a much stronger ratio but saw a declining trend such that its ratio is now at the same level as Microsoft. We should note that this ratio is heavily influenced by substantial investments in financial instruments that Apple has made over the years due to its strong historic cash flow.

PRACTICE PROBLEMS

1. One appropriate method of preparing a common-size cash flow statement is to show each line item:
 - A. of revenue and expense as a percentage of net revenue.
 - B. on the cash flow statement as a percentage of net revenue.
 - C. on the cash flow statement as a percentage of total cash outflows.
2. Which of the following is an appropriate method of computing free cash flow to the firm?
 - A. Add operating cash flows to capital expenditures and deduct after-tax interest payments.
 - B. Add operating cash flows to after-tax interest payments and deduct capital expenditures.
 - C. Deduct both after-tax interest payments and capital expenditures from operating cash flows.
3. The first step in cash flow statement analysis should be to:
 - A. evaluate consistency of cash flows.
 - B. determine operating cash flow drivers.
 - C. identify the major sources and uses of cash.
4. An analyst has calculated a ratio using as the numerator the sum of operating cash flow, interest, and taxes and as the denominator the amount of interest. What is this ratio, what does it measure, and what does it indicate?
 - A. This ratio is an interest coverage ratio, measuring a company's ability to meet its interest obligations and indicating a company's solvency.
 - B. This ratio is an effective tax ratio, measuring the amount of a company's operating cash flow used for taxes and indicating a company's efficiency in tax management.
 - C. This ratio is an operating profitability ratio, measuring the operating cash flow generated accounting for taxes and interest and indicating a company's liquidity.

SOLUTIONS

1. B is correct. An appropriate method to prepare a common-size cash flow statement is to show each line item on the cash flow statement as a percentage of net revenue. An alternative way to prepare a statement of cash flows is to show each item of cash inflow as a percentage of total inflows and each item of cash outflows as a percentage of total outflows.
2. B is correct. Free cash flow to the firm can be computed as operating cash flows plus after-tax interest expense less capital expenditures.
3. C is correct. An overall assessment of the major sources and uses of cash should be the first step in evaluating a cash flow statement.
4. A is correct. This ratio is an interest coverage ratio, measuring a company's ability to meet its interest obligations and indicating a company's solvency. This coverage ratio is based on cash flow information; another common formulation of the interest coverage ratio uses EBITDA based on the income statement as the numerator.

LEARNING MODULE

6

Analysis of Inventories

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	describe the measurement of inventory at the lower of cost and net realisable value and its implications for financial statements and ratios
☐	calculate and explain how inflation and deflation of inventory costs affect the financial statements and ratios of companies that use different inventory valuation methods
☐	describe the presentation and disclosures relating to inventories and explain issues that analysts should consider when examining a company's inventory disclosures and other sources of information

INTRODUCTION

1

The choice of inventory valuation method (also known as the cost formula or cost flow assumption) can have a significant impact on inventory carrying amounts and cost of sales. These items in turn affect other financial statement items, such as current assets, total assets, gross profit, and net income. A company's financial statements and accompanying notes provide important information about its inventory accounting policies that the analyst needs to correctly assess financial performance and compare it with that of other companies.

LEARNING MODULE OVERVIEW



- Inventories are a major factor in the analysis of merchandising and manufacturing companies. Such companies generate their sales and profits through inventory transactions on a regular basis. An important consideration in determining profits for these companies is measuring the cost of sales when inventories are sold.
- The choice of inventory method affects the financial statements and any financial ratios that are based on them. As a consequence, the analyst must carefully consider inventory valuation method differences when evaluating a company's performance over time or in comparison to industry data or industry competitors.

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

- Under International Financial Reporting Standards (IFRS), inventories are measured at the lower of cost and net realizable value. Net realizable value is the estimated selling price in the ordinary course of business less the estimated costs necessary to make the sale. Under US GAAP, inventories are measured at the lower of cost, market value, or net realizable value depending upon the inventory method used. Market value is defined as the current replacement cost subject to an upper limit of net realizable value and a lower limit of net realizable value less a normal profit margin. Reversals of previous write-downs are permissible under IFRS but not under US GAAP.
- Reversals of inventory write-downs may occur under IFRS but are not allowed under US GAAP.
- Changes in the carrying amounts within inventory classifications (such as raw materials, work-in-process, and finished goods) may provide signals about a company's future sales and profits. Relevant information with respect to inventory management and future sales may be found in the management discussion and analysis or similar section within the annual or quarterly reports, industry news and publications, and industry economic data.
- The inventory turnover ratio, number of days of inventory ratio, and gross profit margin ratio are useful in evaluating the management of a company's inventory.
- Financial statement disclosures provide information regarding the accounting policies adopted in measuring inventories, the principal uncertainties regarding the use of estimates related to inventories, and details of the inventory carrying amounts and costs. This information can greatly assist analysts in their evaluation of a company's inventory management.

2

INVENTORY VALUATION



describe the measurement of inventory at the lower of cost and net realisable value and its implications for financial statements and ratios

Significant financial risk can result from the holding of inventory. The cost of inventory may not be recoverable due to spoilage, obsolescence, or declines in selling prices. IFRS states that inventories shall be measured (and carried on the balance sheet) at the lower of cost and net realizable value.¹ Net realizable value is the estimated selling price in the ordinary course of business, less the estimated costs necessary to make the sale and estimated costs to get the inventory in condition for sale. The assessment of net realizable value is typically done item by item or by groups of similar or related items. In the event that the value of inventory declines below the carrying amount on the balance sheet, the inventory carrying amount must be written down to its net realizable value² and the loss (reduction in value) recognized as an expense on the income statement. This expense may be included as part of cost of sales or reported separately.

In each subsequent period, a new assessment of net realizable value is made. Reversal (limited to the amount of the original write-down) is required for a subsequent increase in value of inventory previously written down. The reversal of any write-down of inventories is recognized as a reduction in cost of sales (reduction in the amount of inventories recognized as an expense).

US GAAP used to specify the lower of cost or market to value inventories.³ For fiscal years beginning after 15 December 2016, inventories measured using other than last-in, first-out (LIFO) and retail inventory methods are measured at the lower of cost or net realizable value. This is broadly consistent with IFRS with one major difference: US GAAP prohibits the reversal of write-downs. For inventories measured using LIFO and retail inventory methods, market value is defined as current replacement cost subject to upper and lower limits. Market value cannot exceed net realizable value (i.e., the selling price less reasonably estimated costs of completion and disposal). The lower limit of market value is net realizable value less a normal profit margin. Any write-down to market value or net realizable value reduces the value of the inventory, and the loss in value (expense) generally is reflected in the income statement in the cost of goods sold.

An inventory write-down reduces both profit and the carrying amount of inventory on the balance sheet and thus has a negative effect on profitability, liquidity, and solvency ratios. However, activity ratios (e.g., inventory turnover and total asset turnover) will be positively affected by a write-down because the asset base (denominator) is reduced. The negative impact on some key ratios, due to the decrease in profit, may result in the reluctance by some companies to record inventory write-downs unless evidence is strong that the decline in the value of inventory is permanent. This is especially true under US GAAP, in which case reversal of a write-down is prohibited.

International Accounting Standards 2 (IAS 2), *Inventories*, does not apply to the inventories of producers of agricultural and forest products and minerals and mineral products, nor to commodity broker-traders. These inventories may be measured at net realizable value (fair value less costs to sell and complete) according to well-established industry practices. If an active market exists for these products, the quoted market price in that market is the appropriate basis for determining the fair value of that asset. If an active market does not exist, a company may use market determined prices or values (such as the most recent market transaction price) when available for determining fair value. Changes in the value of inventory (increase or decrease) are recognized in profit or loss in the period of the change. US GAAP is similar to IFRS in its treatment of inventories of agricultural and forest products and mineral ores. Mark-to-market inventory accounting is allowed for bullion.

EXAMPLE 1

Accounting for Declines and Recoveries of Inventory Value

Hatsumei Enterprises, a hypothetical company, manufactures computers and prepares its financial statements in accordance with IFRS. In 2017, the cost of ending inventory was EUR5.2 million, but its net realizable value was EUR4.9 million. The current replacement cost of the inventory is EUR4.7 million. This figure exceeds the net realizable value less a normal profit margin. In 2018, the net realizable value of Hatsumei's inventory was EUR0.5 million greater than the carrying amount.

1. What was the effect of the write-down on Hatsumei's 2017 financial statements? What was the effect of the recovery on Hatsumei's 2018 financial statements?

Solution:

For 2017, Hatsumei would write down its inventory to EUR4.9 million and record the change in value of EUR0.3 million as an expense on the income statement. For 2018, Hatsumei would increase the carrying amount of its inventory and reduce the cost of sales by EUR0.3 million (the recovery is limited to the amount of the original write-down).

2. Under US GAAP, if Hatsumei used the LIFO method, what would be the effects of the write-down on Hatsumei's 2017 financial statements and of the recovery on Hatsumei's 2018 financial statements?

Solution:

Under US GAAP, for 2017, Hatsumei would write down its inventory to EUR4.7 million and typically include the change in value of EUR0.5 million in cost of goods sold on the income statement. For 2018, Hatsumei would not reverse the write-down.

3. What would be the effect of the recovery on Hatsumei's 2018 financial statements if Hatsumei's inventory were agricultural products instead of computers?

Solution:

If Hatsumei's inventory were agricultural products instead of computers, inventory would be measured at net realizable value and Hatsumei, therefore, would increase inventory and record a gain of EUR0.5 million for 2018.

Analysts should consider the possibility of an inventory write-down because the impact on a company's financial ratios may be substantial. The potential for inventory write-downs can be high for companies in industries in which technological obsolescence of inventories is a significant risk. Analysts should carefully evaluate prospective inventory impairments (as well as other potential asset impairments) and their potential effects on the financial ratios when debt covenants include financial ratio requirements. The breaching of debt covenants can have a significant impact on a company.

Companies that use specific identification, weighted average cost, or FIFO methods are more likely to incur inventory write-downs than companies that use the LIFO method. Under the LIFO method, the *oldest* costs are reflected in the inventory carrying amount on the balance sheet. Given increasing inventory costs, the inventory carrying amounts under the LIFO method are already conservatively presented at the oldest and lowest costs. Thus, it is far less likely that inventory write-downs will occur under LIFO—and if a write-down does occur, it is likely to be of a lesser magnitude.

EXAMPLE 2**Effect of Inventory Write-Downs on Financial Ratios**

The Volvo Group, based in Göteborg, Sweden, is a leading supplier of commercial transport products, such as construction equipment, trucks, busses, and drive systems for marine and industrial applications as well as aircraft engine components.⁴ Excerpts from Volvo's consolidated financial statements are shown in Exhibits 1 and 2. Notes pertaining to Volvo's inventories are presented in Exhibit 3.

Exhibit 1: Volvo Group Consolidated Income Statements (Swedish krona in millions, except per share data)

For the years ended 31 December	2017	2016	2015
Net sales	334,748	301,914	312,515
Cost of sales	(254,581)	(231,602)	(240,653)
Gross income	80,167	70,312	71,862
:	:	:	:
Operating income	30,327	20,826	23,318
Interest income and similar credits	164	240	257
Income expenses and similar charges	(1,852)	(1,847)	(2,366)
Other financial income and expenses	(386)	11	(792)
Income after financial items	28,254	19,230	20,418
Income taxes	(6,971)	(6,008)	(5,320)
Income for the period	21,283	13,223	15,099
Attributable to:			
Equity holders of the parent company	20,981	13,147	15,058
Minority interests	302	76	41
Profit	21,283	13,223	15,099

Exhibit 2: Volvo Group Consolidated Balance Sheets (Swedish krona in millions)

31 December	2017	2016	2015
Assets			
Total non-current assets	213,455	218,465	203,478
Current assets:			
Inventories	52,701	48,287	44,390
:	:	:	:
Cash and cash equivalents	36,092	23,949	21,048
Total current assets	199,039	180,301	170,687
Total assets	412,494	398,916	374,165
Shareholders' equity and liabilities			
Equity attributable to equity holders of the parent company	107,069	96,061	83,810
Minority interests	1,941	1,703	1,801
Total shareholders' equity	109,011	97,764	85,610
Total non-current provisions	29,147	29,744	26,704
Total non-current liabilities	96,213	104,873	91,814
Total current provisions	10,806	11,333	14,176
Total current liabilities	167,317	155,202	155,860
Total shareholders' equity and liabilities	412,404	398,916	374,165

Exhibit 3: Volvo Group Selected Notes to Consolidated Financial

Statements

Note 17. Inventories

Accounting Policy

Inventories are reported at the lower of cost and net realizable value. The cost is established using the first-in, first-out principle (FIFO) and is based on the standard cost method, including costs for all direct manufacturing expenses and the attributable share of capacity and other related manufacturing-related costs. The standard costs are tested regularly and adjustments are made based on current conditions. Costs for research and development, selling, administration and financial expenses are not included. Net realizable value is calculated as the selling price less costs attributable to the sale.

Sources of Estimation Uncertainty

Inventory obsolescence

If the net realizable value is lower than cost, a valuation allowance is established for inventory obsolescence. The total inventory value, net of inventory obsolescence allowance, was SEK52,701 (in millions) as of December 2017, and SEK48,287 as of 31 December 2016.

Panel A: Inventory

31 December (millions of krona)	2017	2016	2015
Finished products	32,304	31,012	27,496
Production materials, etc.	20,397	17,275	16,894
Total	52,701	48,287	44,390

Panel B: Increase (decrease) in allowance for inventory obsolescence

31 December (millions of krona)	2017	2016	2015
Opening balance	3,683	3,624	3,394
Change in allowance for inventory obsolescence charged to income	304	480	675
Scrapping	(391)	(576)	(435)
Translation differences	(116)	177	(29)
Reclassifications, etc.	8	(23)	20
Allowance for inventory obsolescence as of 31 December	3,489	3,683	3,624

1. What inventory values would Volvo have reported for 2017, 2016, and 2015 if it had no allowance for inventory obsolescence?

Solution:

31 December (Swedish krona in millions)	2017	2016	2015
Total inventories, net	52,701	48,287	44,390
From Note 17. (Allowance for obsolescence)	3,489	3,683	3,624
Total inventories (without allowance)	56,190	51,970	48,014

2. Assuming that any changes to the allowance for inventory obsolescence are reflected in the cost of sales, what amount would Volvo's cost of sales be for 2017 and 2016 if it had not recorded inventory write-downs in 2017 and 2016?

Solution:

31 December (Swedish krona in millions)	2017	2016
Cost of sales	254,581	231,602
(Increase) decrease in allowance for obsolescence*	194	(59)
Cost of sales without allowance	254,775	231,543

* From Note 17, the decrease in the allowance for obsolescence for 2017 is 194 (3,489 – 3,683) and the increase for 2016 is 59 (3,683 – 3,624).

3. What amount would Volvo's profit (net income) be for 2017 and 2016 if it had not recorded inventory write-downs in 2017 and 2016? Volvo's effective income tax rate was reported as 25 percent for 2017 and 31 percent for 2016.

Solution:

31 December (Swedish krona in millions)	2017	2016
Profit (Net income)	21,283	13,223
Increase (reduction) in cost of sales	(194)	59
Taxes (tax reduction) on operating profit*	49	(18)
Profit (without allowance)	21,138	13,264

* Taxes (tax deductions) on the operating profit are assumed to be 49 (194 × 25%) for 2017 and –18 (–59 × 31%) for 2016.

4. What would Volvo's 2017 profit (net income) have been if it had reversed all past inventory write-downs in 2017? This question is independent of 1, 2, and 3. The effective income tax rate was 25 percent for 2017.

Solution:

31 December (Swedish krona in millions)	2017
Profit (Net income)	21,283
Reduction in cost of sales (increase in operating profit)	3,489
Taxes on increased operating profit*	–872
Profit (after recovery of previous write-downs)	23,900

* Taxes on the increased operating profit are assumed to be 872 (3,489 × 25%) for 2017.

5. Compare the following for 2017 based on the numbers as reported and those assuming no allowance for inventory obsolescence as in questions 1,

2, and 3: inventory turnover ratio, days of inventory on hand, gross profit margin, and net profit margin.

Solution:

The Volvo Group's financial ratios for 2017 with the allowance for inventory obsolescence and without the allowance for inventory obsolescence are as follows:

	With Allowance (As Reported)	Without Allowance (Adjusted)
Inventory turnover ratio	5.04	4.71
Days of inventory on hand	72.4	77.5
Gross profit margin	23.95%	23.89%
Net profit margin	6.36%	6.31%

Inventory turnover ratio = Cost of sales ÷ Average inventory

With allowance (as reported) = 5.04 = $254,581 \div [(52,701 + 48,287) \div 2]$

Without allowance (adjusted) = 4.71 = $254,775 \div [(56,190 + 51,970) \div 2]$

Inventory turnover is higher based on the numbers as reported because inventory carrying amounts will be lower with an allowance for inventory obsolescence. The company might appear to manage its inventory more efficiently when it has inventory write-downs.

Days of inventory on hand

= Number of days in period ÷ Inventory turnover ratio

With allowance (as reported) = 72.4 days = $(365 \text{ days} \div 5.04)$

Without allowance (adjusted) = 77.5 days = $(365 \text{ days} \div 4.71)$

Days of inventory on hand are lower based on the numbers as reported because the inventory turnover is higher. A company with inventory write-downs might appear to manage its inventory more effectively. This is primarily the result of the lower inventory carrying amounts.

Gross profit margin = Gross profit ÷ Net sales

With allowance (as reported) = 23.95% = $(80,167 \div 334,748)$

Without allowance (adjusted) = 23.89% = $[(80,167 - 194) \div 334,748]$

In this instance, the gross profit margin is slightly higher with inventory write-downs because the cost of sales is lower (due to the reduction in the allowance for inventory obsolescence). This assumes that inventory write-downs (and inventory write-down recoveries) are reported as part of cost of sales.

Net profit margin = Profit ÷ Net sales

With allowance (as reported) = 6.36% = $(21,283 \div 334,748)$

Without allowance (adjusted) = 6.31% = $(21,138 \div 334,748)$

In this instance, the net profit margin is higher with inventory write-downs because the cost of sales is lower (due to the reduction in the allowance for

inventory obsolescence). The absolute percentage difference is less than that of the gross profit margin because of the income tax reduction on the decreased income without write-downs.

The profitability ratios (gross profit margin and net profit margin) for Volvo Group would have been slightly lower for 2017 if the company had not recorded inventory write-downs. The activity ratio (inventory turnover ratio) would appear less attractive without the write-downs. The inventory turnover ratio is slightly better (higher) with inventory write-downs because inventory write-downs decrease the average inventory (denominator), making inventory management appear more efficient with write-downs.

THE EFFECTS OF INFLATION AND DEFLATION ON INVENTORIES, COSTS OF SALES, AND GROSS MARGIN

3



calculate and explain how inflation and deflation of inventory costs affect the financial statements and ratios of companies that use different inventory valuation methods

The allocation of the total cost of goods available for sale to cost of sales on the income statement and to ending inventory on the balance sheet varies under the different inventory valuation methods. In an environment of declining inventory unit costs and constant or increasing inventory quantities, first-in, first-out (FIFO) (in comparison with weighted average cost or LIFO) will allocate a higher amount of the total cost of goods available for sale to cost of sales on the income statement and a lower amount to ending inventory on the balance sheet. Accordingly, because cost of sales will be higher under FIFO, a company's gross profit, operating profit, and income before taxes will be lower.

Conversely, in an environment of rising inventory unit costs and constant or increasing inventory quantities, FIFO (in comparison with weighted average cost or LIFO) will allocate a lower amount of the total cost of goods available for sale to cost of sales on the income statement and a higher amount to ending inventory on the balance sheet. Accordingly, because cost of sales will be lower under FIFO, a company's gross profit, operating profit, and income before taxes will be higher.

The carrying amount of inventories under FIFO will more closely reflect current replacement values because inventories are assumed to consist of the most recently purchased items. The cost of sales under LIFO will more closely reflect current replacement value. LIFO ending inventory amounts typically are not reflective of current replacement value because the ending inventory is assumed to be the oldest inventory and costs are allocated accordingly. Example 3 illustrates the different results obtained by using either the FIFO or LIFO methods to account for inventory.

EXAMPLE 3

Impact of Inflation Using LIFO Compared to FIFO

Company L and Company F are identical in all respects except that Company L uses the LIFO method and Company F uses the FIFO method. Each company has been in business for five years and maintains a base inventory of 2,000 units each year. Each year, except the first year, the number of units purchased

equaled the number of units sold. Over the five year period, unit sales increased 10 percent each year and the unit purchase and selling prices increased at the beginning of each year to reflect inflation of 4 percent per year. In the first year, 20,000 units were sold at a price of USD15.00 per unit and the unit purchase price was USD8.00.

1. What was the end-of-year inventory, sales, cost of sales, and gross profit for each company for each of the five years?

Solution:

Company L using LIFO (in USD)	Year 1	Year 2	Year 3	Year 4	Year 5
Ending inventory ^a	16,000	16,000	16,000	16,000	16,000
Sales ^b	300,000	343,200	392,621	449,158	513,837
Cost of sales ^c	160,000	183,040	209,398	239,551	274,046
Gross profit	140,000	160,160	183,223	209,607	239,791

^a Inventory is unchanged at USD16,000 each year (2,000 units × USD8). 2,000 of the units acquired in the first year are assumed to remain in inventory.

^b Sales Year X = (20,000 × USD15)(1.10)^{X-1}(1.04)^{X-1}. The quantity sold increases by 10 percent each year and the selling price increases by 4 percent each year.

^c Cost of sales Year X = (20,000 × USD8)(1.10)^{X-1}(1.04)^{X-1}. In Year 1, 20,000 units are sold with a cost of USD8. In subsequent years, the number of units purchased equals the number of units sold and the units sold are assumed to be those purchased in the year. The quantity purchased increases by 10 percent each year and the purchase price increases by 4 percent each year.

If the company sold more units than it purchased in a year, inventory would decrease. This is referred to as LIFO liquidation. The cost of sales of the units sold in excess of those purchased would reflect the inventory carrying amount. In this example, each unit sold in excess of those purchased would have a cost of sales of USD8 and a higher gross profit.

Company F using FIFO (in US dollars)	Year 1	Year 2	Year 3	Year 4	Year 5
Ending inventory ^a	16,000	16,640	17,306	17,998	18,718
Sales ^b	300,000	343,200	392,621	449,158	513,837
Cost of sales ^c	160,000	182,400	208,732	238,859	273,326
Gross profit	140,000	160,800	183,889	210,299	240,511

^a Ending Inventory Year X = 2,000 units × Cost in Year X = 2,000 units [USD8 × (1.04)^{X-1}]; 2,000 units of the units acquired in Year X are assumed to remain in inventory.

^b Sales Year X = (20,000 × USD15)(1.10)^{X-1}(1.04)^{X-1}.

^c Cost of sales Year 1 = USD160,000 (= 20,000 units × USD8). There was no beginning inventory.

Cost of sales Year X (where X ≠ 1)

= Beginning inventory plus purchases less ending inventory

= (Inventory at Year X-1) + [(20,000 × USD8)(1.10)^{X-1}(1.04)^{X-1}]
- (Inventory at Year X)

= 2,000(USD8)(1.04)^{X-2} + [(20,000 × USD8)(1.10)^{X-1}(1.04)^{X-1}] - [2,000(USD8)(1.04)^{X-1}].

For example, cost of sales Year 2

= 2,000(USD8) + [(20,000 × USD8)(1.10)(1.04)] - [2,000(USD8)(1.04)]

$$= \text{USD}16,000 + \text{USD}183,040 - \text{USD}16,640 = \text{USD}182,400.$$

2. Compare the inventory turnover ratios (based on ending inventory carrying amounts) and gross profit margins over the five-year period and between companies.

Solution:

Year	Company L					Company F				
	1	2	3	4	5	1	2	3	4	5
Inventory turnover	10.0	11.4	13.1	15.0	17.1	10.0	11.0	12.1	13.3	14.6
Gross profit margin (%)	46.7	46.7	46.7	46.7	46.7	46.7	46.9	46.8	46.8	46.8

Inventory turnover ratio = Cost of sales ÷ Ending inventory.

The inventory turnover ratio increased each year for both companies because the units sold increased, whereas the units in ending inventory remained unchanged. The increase in the inventory turnover ratio is higher for Company L because Company L's cost of sales is increasing for inflation, but the inventory carrying amount is unaffected by inflation. It might appear that a company using the LIFO method manages its inventory more effectively, but this is deceptive. Both companies have identical quantities and prices of purchases and sales and only differ in the inventory valuation method used.

Gross profit margin = Gross profit ÷ Sales.

The gross profit margin is stable under LIFO because both sales and cost of sales increase at the same rate of inflation. The gross profit margin is slightly higher under the FIFO method after the first year because a proportion of the cost of sales reflects an older purchase price.

PRESENTATION AND DISCLOSURE

4

- ☐ describe the presentation and disclosures relating to inventories and explain issues that analysts should consider when examining a company's inventory disclosures and other sources of information

The choice of inventory valuation method affects the financial statements. The financial statement items affected include cost of sales, gross profit, net income, inventories, current assets, and total assets. Therefore, the choice of inventory valuation method also affects financial ratios that contain these items. Ratios such as current ratio, return on assets, gross profit margin, and inventory turnover also are affected. As a consequence, analysts must carefully consider inventory valuation method differences when evaluating a company's performance over time or when comparing its performance with the performance of the industry or industry competitors. Additionally, the financial statement items and ratios may be affected by adjustments of inventory carrying amounts to net realizable value or current replacement cost.

Presentation and Disclosure

IFRS requires the following financial statement disclosures concerning inventory:

- a. the accounting policies adopted in measuring inventories, including the cost formula (inventory valuation method) used;
- b. the total carrying amount of inventories and the carrying amount in classifications (e.g., merchandise, raw materials, production supplies, work in progress, and finished goods) appropriate to the entity;
- c. the carrying amount of inventories carried at fair value less costs to sell;
- d. the amount of inventories recognized as an expense during the period (cost of sales);
- e. the amount of any write-down of inventories recognized as an expense in the period;
- f. the amount of any reversal of any write-down that is recognized as a reduction in cost of sales in the period;
- g. the circumstances or events that led to the reversal of a write-down of inventories; and
- h. the carrying amount of inventories pledged as security for liabilities.

Inventory-related disclosures under US GAAP are similar to these disclosures, except that requirements (f) and (g) are not relevant because US GAAP does not permit the reversal of prior-year inventory write-downs. US GAAP also requires the disclosure of significant estimates applicable to inventories and of any material amount of income resulting from the liquidation of LIFO inventory.

Inventory Ratios

Three ratios often used to evaluate the efficiency and effectiveness of inventory management are inventory turnover, days of inventory on hand, and gross profit margin.⁵ These ratios are directly affected by a company's choice of inventory valuation method. Analysts should be aware, however, that many other ratios are also affected by the choice of inventory valuation method, although less directly. These include the current ratio, because inventory is a component of current assets; the return-on-assets ratio, because cost of sales is a key component in deriving net income and inventory is a component of total assets; and even the debt-to-equity ratio, because the cumulative measured net income from the inception of a business is an aggregate component of retained earnings.

The inventory turnover ratio measures the number of times during the year a company sells (i.e., turns over) its inventory. The higher the turnover ratio, the more times that inventory is sold during the year and the lower the relative investment of resources in inventory. Days of inventory on hand can be calculated as days in the period divided by inventory turnover. Thus, inventory turnover and days of inventory on hand are inversely related. It may be that inventory turnover, however, is calculated using average inventory in the year, whereas days of inventory on hand is based on the ending inventory amount. In general, inventory turnover and the number of days of inventory on hand should be benchmarked against industry norms and compared across years.

A high inventory turnover ratio and a low number of days of inventory on hand might indicate highly effective inventory management. Alternatively, a high inventory ratio and a low number of days of inventory on hand could indicate that the company does not carry an adequate amount of inventory or that the company has written down inventory values. Inventory shortages could potentially result in lost sales or production problems in the case of the raw materials inventory of a manufacturer. To assess which explanation is more likely, analysts can compare the company's inventory turnover and sales growth rate with those of the industry and review financial statement disclosures. Slower growth combined with higher inventory turnover could indicate inadequate inventory levels. Write-downs of inventory could reflect poor inventory management. Minimal write-downs and sales growth rates at or above the industry's growth rates would support the interpretation that the higher turnover reflects greater efficiency in managing inventory.

A low inventory turnover ratio and a high number of days of inventory on hand relative to industry norms could be an indicator of slow-moving or obsolete inventory. Again, comparing the company's sales growth across years and with the industry and reviewing financial statement disclosures can provide additional insight.

The gross profit margin, the ratio of gross profit to sales, indicates the percentage of sales being contributed to net income as opposed to covering the cost of sales. Firms in highly competitive industries generally have lower gross profit margins than firms in industries with fewer competitors. A company's gross profit margin may be a function of its type of product. A company selling luxury products generally will have higher gross profit margins than a company selling staple products. The inventory turnover of the company selling luxury products, however, is likely to be much lower than the inventory turnover of the company selling staple products.

EXAMPLE 4

Single Company Illustration

Selected excerpts from the consolidated financial statements and notes to consolidated financial statements for Jollof Inc., a hypothetical telecommunications company providing networking and communications solutions. Exhibit 4 contains excerpts from the consolidated income statements, and Exhibit 5 contains excerpts from the consolidated balance sheets. Exhibit 6 contains excerpts from three of the notes to consolidated financial statements.

Note 1(a) discloses that Jollof's finished goods inventories and work in progress are valued at the lower of cost or net realizable value. Note 2(a) discloses that the impact of inventory and work in progress write-downs on Jollof's income before tax was a net reduction of EUR239 million in 2017, a net reduction of EUR156 million in 2016, and a net reduction of EUR65 million in 2015.⁶ The inventory impairment loss amounts steadily increased from 2015 to 2017 and are included as a component, (additions)/reversals, of Jollof's change in valuation allowance as disclosed in Note 3(b) from Exhibit 6. Observe also that Jollof discloses its valuation allowance at 31 December 2017, 2016, and 2015 in Note 3(b) and details on the allocation of the allowance are included in Note 3(a). The EUR549 million valuation allowance is the total of a EUR528 million allowance for inventories and a EUR21 million allowance for work in progress on construction contracts. Finally, observe that the EUR1,845 million net value for inventories (excluding construction contracts) at 31 December 2017 in Note 3(a) reconciles with the balance sheet amount for inventories and work in progress, net, on 31 December 2017, as presented in Exhibit 5.

The inventory valuation allowance represents the total amount of inventory write-downs taken for the inventory reported on the balance sheet (which is measured at the lower of cost or net realizable value). Therefore, an analyst can determine the historical cost of the company's inventory by adding the inventory valuation allowance to the reported inventory carrying amount on the balance sheet. The valuation allowance increased in magnitude and as a percentage of gross inventory values from 2015 to 2017.

Exhibit 4: Alcatel-Lucent Consolidated Income Statements (in millions of euros)

For years ended 31 December	2017	2016	2015
Revenues	14,267	14,945	10,317
Cost of sales	(9,400)	(10,150)	(6,900)
Gross profit	4,867	4,795	3,417
Administrative and selling expenses	(2,598)	(2,908)	(1,605)
Research and development costs	(2,316)	(2,481)	(1,235)
Income from operating activities before restructuring costs, impairment of assets, gain/(loss) on disposal of consolidated entities, and post-retirement benefit plan amendments	(47)	(594)	577
Restructuring costs	(472)	(719)	(594)
Impairment of assets	(3,969)	(2,473)	(118)
Gain/(loss) on disposal of consolidated entities	(6)	—	13
Post-retirement benefit plan amendments	39	217	—
Income (loss) from operating activities	(4,455)	(3,569)	(122)
⋮	⋮	⋮	⋮
Income (loss) from continuing operations	(4,373)	(3,433)	(184)
Income (loss) from discontinued operations	28	512	133
Net income (loss)	(4,345)	(2,921)	51

Exhibit 5: Alcatel-Lucent Consolidated Balance Sheets (in millions of euros)

31 December	2017	2016	2015
⋮	⋮	⋮	⋮
Total non-current assets	10,703	16,913	21,559
Inventories and work in progress, net	1,845	1,877	1,898
Amounts due from customers on construction contracts	416	591	517
Trade receivables and related accounts, net	3,637	3,497	3,257
Advances and progress payments	83	92	73
⋮	⋮	⋮	⋮
Total current assets	12,238	11,504	13,629
Total assets	22,941	28,417	35,188
⋮	⋮	⋮	⋮
Retained earnings, fair value, and other reserves	(7,409)	(3,210)	(2,890)
⋮	⋮	⋮	⋮

31 December	2017	2016	2015
Total shareholders' equity	4,388	9,830	13,711
Pensions, retirement indemnities, and other post-retirement benefits	4,038	3,735	4,577
Bonds and notes issued, long-term	3,302	3,794	4,117
Other long-term debt	56	40	123
Deferred tax liabilities	968	1,593	2,170
Other non-current liabilities	372	307	232
Total non-current liabilities	8,736	9,471	11,219
Provisions	2,036	2,155	1,987
Current portion of long-term debt	921	406	975
Customers' deposits and advances	780	711	654
Amounts due to customers on construction contracts	158	342	229
Trade payables and related accounts	3,840	3,792	3,383
Liabilities related to disposal groups held for sale	—	—	1,349
Current income tax liabilities	155	59	55
Other current liabilities	1,926	1,651	1,625
Total current liabilities	9,817	9,117	10,257
Total liabilities and shareholders' equity	22,941	28,417	35,188

Exhibit 6: Jollof Inc. Selected Notes to Consolidated Financial Statements

Note 1. Summary of Significant Accounting Policies

(a) Inventories and work in progress

Inventories and work in progress are valued at the lower of cost (including indirect production costs where applicable) or net realizable value. Net realizable value is the estimated sales revenue for a normal period of activity less expected completion and selling costs.

Note 2. Principal uncertainties regarding the use of estimates

(a) Valuation allowance for inventories and work in progress

Inventories and work in progress are measured at the lower of cost or net realizable value. Valuation allowances for inventories and work in progress are calculated based on an analysis of foreseeable changes in demand, technology, or the market, in order to determine obsolete or excess inventories and work in progress.

The valuation allowances are accounted for in cost of sales or in restructuring costs, depending on the nature of the amounts concerned.

	31 December		
(millions of euros)	2017	2016	2015
Valuation allowance for inventories and work in progress on construction contracts	(549)	(432)	318
Impact of inventory and work in progress write-downs on income (loss) before income tax related reduction of goodwill and discounted operations	(239)	(156)	(65)

Note 3. Inventories and work in progress

(a) Analysis of net value

(millions of euros)	2017	2016	2015
Raw materials and goods	545	474	455
Work in progress excluding construction contracts	816	805	632
Finished goods	1,011	995	1,109
Gross value (excluding construction contracts)	2,373	2,274	2,196
Valuation allowance	(528)	(396)	(298)
Net value (excluding construction contracts)	1,845	1,877	1,898
Work in progress on construction contracts, gross*	184	228	291
Valuation allowance	(21)	(35)	(19)
Work in progress on construction contracts, net	163	193	272
Total, net	2,008	2,071	2,170

* Included in the amounts due from/to construction contracts.

(b) Change in valuation allowance

(millions of euros)	2017	2016	2015
At 1 January	(432)	(318)	(355)
(Additions)/reversals	(239)	(156)	(65)
Utilization	58	32	45
Changes in consolidation group			45
Net effect of exchange rate changes and other changes	63	10	12
At 31 December	(549)	(432)	(318)

Rounding differences may result in totals that are slightly different from the sum and from corresponding numbers in the note.

1. Calculate Jollof's inventory turnover, number of days of inventory on hand, gross profit margin, current ratio, debt-to-equity ratio, and return on total assets for 2017 and 2016 based on the numbers reported. Use an average for inventory and total asset amounts and year-end numbers for other ratio items. For debt, include only bonds and notes issued, long-term; other long-term debt; and current portion of long-term debt.

Solution:

The financial ratios are as follows:

	2017	2016
Inventory turnover ratio	5.05	5.38
Number of days of inventory on hand	72.3 days	67.8 days
Gross profit margin	34.1%	32.1%
Current ratio	1.25	1.26
Debt-to-equity ratio	0.98	0.43
Return on total assets	-16.9%	-9.2%

Inventory turnover ratio = Cost of sales ÷ Average inventory

2017 inventory turnover ratio = 5.05 = 9,400 ÷ [(1,845 + 1,877) ÷ 2]

$$2016 \text{ inventory turnover ratio} = 5.38 = 10,150 \div [(1,877 + 1,898) \div 2]$$

$$\text{Number of days of inventory} = 365 \text{ days} \div \text{Inventory turnover ratio}$$

$$2017 \text{ number of days of inventory} = 72.3 \text{ days} = 365 \text{ days} \div 5.05$$

$$2016 \text{ number of days of inventory} = 67.8 \text{ days} = 365 \text{ days} \div 5.38$$

$$\text{Gross profit margin} = \text{Gross profit} \div \text{Total revenue}$$

$$2017 \text{ gross profit margin} = 34.1\% = 4,867 \div 14,267$$

$$2016 \text{ gross profit margin} = 32.1\% = 4,795 \div 14,945$$

$$\text{Current ratio} = \text{Current assets} \div \text{Current liabilities}$$

$$2017 \text{ current ratio} = 1.25 = 12,238 \div 9,817$$

$$2016 \text{ current ratio} = 1.26 = 11,504 \div 9,117$$

$$\text{Debt-to-equity ratio} = \text{Total debt} \div \text{Total shareholders' equity}$$

$$2017 \text{ debt-to-equity ratio} = 0.98 = (3,302 + 56 + 921) \div 4,388$$

$$2016 \text{ debt-to-equity ratio} = 0.43 = (3,794 + 40 + 406) \div 9,830$$

$$\text{Return on assets} = \text{Net income} \div \text{Average total assets}$$

$$2017 \text{ return on assets} = -16.9\% = -4,345 \div [(22,941 + 28,417) \div 2]$$

$$2016 \text{ return on assets} = -9.2\% = -2,921 \div [(28,417 + 35,188) \div 2]$$

2. Based on the answer to question 1, comment on the changes from 2016 to 2017.

Solution:

From 2016 to 2017, the inventory turnover ratio declined and the number of days of inventory increased by 4.5 days. Jollof appears to be managing inventory less efficiently. The gross profit margin improved by 2.0 percent, from 32.1 percent in 2016 to 34.1 percent in 2017. The current ratio is relatively unchanged from 2016 to 2017. The debt-to-equity ratio has risen significantly in 2017 compared to 2016. Although Jollof's total debt has been relatively stable during this time period, the company's equity has been declining rapidly because of the cumulative effect of its net losses on retained earnings. The return on assets is negative and deteriorated in 2017 compared to 2016. A larger net loss and lower total assets in 2017 resulted in a higher negative return on assets. The analyst should investigate the underlying reasons for the sharp decline in Jollof's return on assets. From Exhibit 4, it is apparent that Jollof's gross profit margins were insufficient to cover the administrative and selling expenses and research and development costs in 2016 and 2017. Large restructuring costs and asset impairment losses contributed to the loss from operating activities in both 2016 and 2017.

3. If Jollof had used the weighted average cost method instead of the FIFO method during 2017, 2016, and 2015, what would be the effect on Jollof's reported cost of sales and inventory carrying amounts? What would be the

directional impact on the financial ratios that were calculated for Jollof in Question 1?

Solution:

If inventory replacement costs were increasing during 2015, 2016, and 2017 (and inventory quantity levels were stable or increasing), Jollof's cost of sales would have been higher and its gross profit margin would have been lower under the weighted average cost inventory method than what was reported under the FIFO method (assuming no inventory write-downs that otherwise would neutralize the differences between the inventory valuation methods). FIFO allocates the oldest inventory costs to cost of sales; the reported cost of sales would be lower under FIFO given increasing inventory costs. Inventory carrying amounts would be higher under the FIFO method than under the weighted average cost method because the more recently purchased inventory items would be included in inventory at their higher costs (again assuming no inventory write-downs that otherwise would neutralize the differences between the inventory valuation methods). Consequently, Jollof's reported gross profit, net income, and retained earnings would also be higher for those years under the FIFO method.

The effects on ratios are as follows:

- The inventory turnover ratios would all be higher under the weighted average cost method because the numerator (cost of sales) would be higher and the denominator (inventory) would be lower than what was reported by Jollof under the FIFO method.
- The number of days of inventory would be lower under the weighted average cost method because the inventory turnover ratios would be higher.
- The gross profit margin ratios would all be lower under the weighted average cost method because cost of sales would be higher under the weighted average cost method than under the FIFO method.
- The current ratios would all be lower under the weighted average cost method because inventory carrying values would be lower than under the FIFO method (current liabilities would be the same under both methods).
- The return-on-assets ratios would all be lower under the weighted average cost method because the incremental profit added to the numerator (net income) has a greater impact than the incremental increase to the denominator (total assets). By way of example, assume that a company has EUR3 million in net income and EUR100 million in total assets using the weighted average cost method. If the company reports another EUR1 million in net income by using FIFO instead of weighted average cost, it would then also report an additional EUR1 million in total assets (after tax). Based on this example, the return on assets is 3.00 percent ($\text{EUR}3/\text{EUR}100$) under the weighted average cost method and 3.96 percent ($\text{EUR}4/\text{EUR}101$) under the FIFO method.
- The debt-to-equity ratios would all be higher under the weighted average cost method because retained earnings would be lower than under the FIFO method (again assuming no inventory write-downs that otherwise would neutralize the differences between the inventory valuation methods).

- Conversely, if inventory replacement costs were decreasing during 2015, 2016, and 2017 (and inventory quantity levels were stable or increasing), Jollof's cost of sales would have been lower and its gross profit and inventory would have been higher under the weighted average cost method than were reported under the FIFO method (assuming no inventory write-downs that otherwise would neutralize the differences between the inventory valuation methods). As a result, the ratio assessment that was performed above would result in directly opposite conclusions.

PRACTICE PROBLEMS

1. Carrying inventory at a value above its historical cost would *most likely* be permitted if:
 - A. the inventory was held by a producer of agricultural products.
 - B. financial statements were prepared using US GAAP.
 - C. the change resulted from a reversal of a previous write-down.
2. Eric's Used Book Store prepares its financial statements in accordance with IFRS. Inventory was purchased for GBP1 million and later marked down to GBP550,000. One of the books, however, was later discovered to be a rare collectible item, and the inventory is now worth an estimated GBP3 million. The inventory is *most likely* reported on the balance sheet at:
 - A. GBP550,000.
 - B. GBP1,000,000.
 - C. GBP3,000,000.
3. Fernando's Pasta purchased inventory and later wrote it down. The current net realizable value is higher than the value when written down. Fernando's inventory balance will *most likely* be:
 - A. higher if it complies with IFRS.
 - B. higher if it complies with US GAAP.
 - C. the same under US GAAP and IFRS.
4. A write-down of the value of inventory to its net realizable value will have a positive effect on the:
 - A. balance sheet.
 - B. income statement.
 - C. inventory turnover ratio.
5. Zimt AG uses the FIFO method, and Nutmeg Inc. uses the LIFO method. Compared to the cost of replacing the inventory, during periods of rising prices, the cost of sales reported by:
 - A. Zimt is too low.
 - B. Nutmeg is too low.
 - C. Nutmeg is too high.
6. Zimt AG uses the FIFO method, and Nutmeg Inc. uses the LIFO method. Compared to the cost of replacing the inventory, during periods of rising prices the ending inventory balance reported by:
 - A. Zimt is too high.
 - B. Nutmeg is too low.

- C. Nutmeg is too high.
7. Like many technology companies, TechnoTools operates in an environment of declining prices. Its reported profits will tend to be *highest* if it accounts for inventory using the:
- A. FIFO method.
 - B. LIFO method.
 - C. Weighted average cost method.
8. Compared to using the weighted average cost method to account for inventory, during a period in which prices are generally rising, the current ratio of a company using the FIFO method would *most likely* be:
- A. lower.
 - B. higher.
 - C. dependent upon the interaction with accounts payable.
9. Zimt AG wrote down the value of its inventory in 2017 and reversed the write-down in 2018. Compared to the ratios that would have been calculated if the write-down had never occurred, Zimt's reported that the 2017:
- A. current ratio was too high.
 - B. gross margin was too high.
 - C. inventory turnover was too high.
10. Zimt AG wrote down the value of its inventory in 2017 and reversed the write-down in 2018. Compared to the results the company would have reported if the write-down had never occurred, Zimt's reported that the 2018:
- A. profit was overstated.
 - B. cash flow from operations was overstated.
 - C. year-end inventory balance was overstated.
11. Compared to a company that uses the FIFO method, during periods of rising prices a company that uses the LIFO method will *most likely* appear more:
- A. liquid.
 - B. efficient.
 - C. profitable.
12. Nutmeg, Inc. uses the LIFO method to account for inventory. During years in which inventory unit costs are generally rising and in which the company purchases more inventory than it sells to customers, its reported gross profit margin will *most likely* be:
- A. lower than it would be if the company used the FIFO method.
 - B. higher than it would be if the company used the FIFO method.
 - C. about the same as it would be if the company used the FIFO method.

13. Compared to using the FIFO method to account for inventory, during periods of rising prices, a company using the LIFO method is *most likely* to report higher:
- A. net income.
 - B. cost of sales.
 - C. income taxes.
14. Carey Company reports under US GAAP, whereas Jonathan Company reports under IFRS. It is *least likely* that:
- A. Carey has reversed an inventory write-down.
 - B. Jonathan has reversed an inventory write-down.
 - C. Jonathan and Carey both use the FIFO inventory accounting method.

The following information relates to questions 15-21

Hans Annan, CFA, a food and beverage analyst, is reviewing Century Chocolate's inventory policies as part of his evaluation of the company. Century Chocolate, based in Switzerland, manufactures chocolate products and purchases and resells other confectionery products to complement its chocolate line. Annan visited Century Chocolate's manufacturing facility last year. He learned that cacao beans, imported from Brazil, represent the most significant raw material and that the work-in-progress inventory consists primarily of three items: roasted cacao beans, a thick paste produced from the beans (called chocolate liquor), and a sweetened mixture that needs to be "conched" to produce chocolate. On the tour, Annan learned that the conching process ranges from a few hours for lower-quality products to six days for the highest-quality chocolates. While there, Annan saw the facility's climate-controlled area where manufactured finished products (cocoa and chocolate) and purchased finished goods are stored prior to shipment to customers. After touring the facility, Annan had a discussion with Century Chocolate's CFO regarding the types of costs that were included in each inventory category.

Annan has asked his assistant, Joanna Kern, to gather some preliminary information regarding Century Chocolate's financial statements and inventories. He also asked Kern to calculate the inventory turnover ratios for Century Chocolate and another chocolate manufacturer for the most recent five years. Annan does not know Century Chocolate's most direct competitor, so he asks Kern to do some research and select the most appropriate company for the ratio comparison.

Kern reports back that Century Chocolate prepares its financial statements in accordance with IFRS. She tells Annan that the policy footnote states that raw materials and purchased finished goods are valued at purchase cost, whereas work in progress and manufactured finished goods are valued at production cost. Raw material inventories and purchased finished goods are accounted for using the FIFO method, and the weighted average cost method is used for other inventories. An allowance is established when the net realizable value of any inventory item is lower than the value calculated previously.

Kern provides Annan with the selected financial statements and inventory data for Century Chocolate. The ratio exhibit Kern prepared compares Century Chocolate's inventory turnover ratios to those of Gordon's Goodies, a US-based com-

pany. Annan returns the exhibit and tells Kern to select a different competitor that reports using IFRS rather than US GAAP. During this initial review, Annan asks Kern why she has not indicated whether Century Chocolate uses a perpetual or a periodic inventory system. Kern replies that she learned that Century Chocolate uses a perpetual system but did not include this information in her report because inventory values would be the same under either a perpetual or periodic inventory system. Annan tells Kern she is wrong and directs her to research the matter.

While Kern is revising her analysis, Annan reviews the most recent month's Cocoa Market Review from the International Cocoa Organization. He is drawn to the statement that "the ICCO daily price, averaging prices in both futures markets, reached a 29-year high in US dollar terms and a 23-year high in special drawing rights (SDRs) terms (the SDR unit comprises a basket of major currencies used in international trade: US dollar, euro, pound sterling, and yen)." Annan makes a note that he will need to factor the potential continuation of this trend into his analysis.

Exhibit 1: Century Chocolate Financial Statements

A. Century Chocolate Income Statements (millions of Swiss francs)		
For Years Ended 31 December	2018	2017
Sales	95,290	93,248
Cost of sales	−41,043	−39,047
Marketing, administration, and other expenses	−35,318	−42,481
Profit before taxes	18,929	11,720
Taxes	−3,283	−2,962
Profit for the period	15,646	8,758
B. Century Chocolate Balance Sheets (millions of Swiss francs)		
31 December	2018	
Cash, cash equivalents, and short-term investments	6,190	8,252
Trade receivables and related accounts, net	11,654	12,910
Inventories, net	8,100	7,039
Other current assets	2,709	2,812
Total current assets	28,653	31,013
Property, plant, and equipment, net	18,291	19,130
Other non-current assets	45,144	49,875
Total assets	92,088	100,018
Trade and other payables	10,931	12,299
Other current liabilities	17,873	25,265
Total current liabilities	28,804	37,564
Non-current liabilities	15,672	14,963
Total liabilities	44,476	52,527
Equity		
Share capital	332	341

B. Century Chocolate Balance Sheets (millions of Swiss francs)

31 December	2018	
Retained earnings and other reserves	47,280	47,150
Total equity	47,612	47,491
Total liabilities and shareholders' equity	92,088	100,018

C. Century Chocolate Supplementary Footnote Disclosures: Inventories (millions of Swiss francs)

31 December	2018	2017
Raw Materials	2,154	1,585
Work in Progress	1,061	1,027
Finished Goods	5,116	4,665
Total inventories before allowance	8,331	7,277
Allowance for write-downs to net realizable value	-231	-238
Total inventories net of allowance	8,100	7,039

D. Century Chocolate Inventory Record for Purchased Lemon Drops

Date		Cartons	Per Unit Amount (Swiss francs)
	Beginning inventory	100	22
4 Feb 2018	Purchase	40	25
3 Apr 2018	Sale	50	32
23 Jul 2018	Purchase	70	30
16 Aug 2018	Sale	100	32
9 Sep 2018	Sale	35	32
15 Nov 2018	Purchase	100	28

E. Century Chocolate Net Realizable Value Information for Black Licorice Jelly Beans

	2018	2017
FIFO cost of inventory at 31 December (Swiss francs)	314,890	374,870
Ending inventory at 31 December (kilograms)	77,750	92,560
Cost per unit (Swiss francs)	4.05	4.05
Net Realizable Value (Swiss francs per kilograms)	4.20	3.95

15. The costs *least likely* to be included by the CFO as inventory are:

- A. storage costs for the chocolate liquor.
- B. excise taxes paid to the government of Brazil for the cacao beans.
- C. storage costs for chocolate and purchased finished goods awaiting shipment to customers.

16. What is the *most likely* justification for Century Chocolate's choice of inventory valuation method for its purchased finished goods?

- A. It is the preferred method under IFRS.
- B. It allocates the same per unit cost to both cost of sales and inventory.

- C. Ending inventory reflects the cost of goods purchased most recently.
17. In Kern's comparative ratio analysis, the 2018 inventory turnover ratio for Century Chocolate is *closest* to:
- A. 5.07.
 - B. 5.42.
 - C. 5.55.
18. The *most accurate* statement regarding Annan's reasoning for requiring Kern to select a competitor that reports under IFRS for comparative purposes is that under US GAAP:
- A. fair values are used to value inventory.
 - B. the LIFO method is permitted to value inventory.
 - C. the specific identification method is permitted to value inventory.
19. Annan's statement regarding the perpetual and periodic inventory systems is most significant when which of the following costing systems is used?
- A. LIFO
 - B. FIFO
 - C. Specific identification
20. Ignoring any tax effect, the change in net realizable value of the black licorice jelly beans from 2017 to 2018 will *most likely* result in:
- A. an increase in gross profit of CHF7,775.
 - B. an increase in gross profit of CHF11,670.
 - C. no impact on cost of sales because under IFRS, write-downs cannot be reversed.
21. If the trend noted in the ICCO report continues and Century Chocolate plans to maintain constant or increasing inventory quantities, the *most likely* impact on Century Chocolate's financial statements related to its raw materials inventory will be:
- A. a cost of sales that more closely reflects current replacement values.
 - B. a higher allocation of the total cost of goods available for sale to cost of sales.
 - C. a higher allocation of the total cost of goods available for sale to ending inventory.
-

The following information relates to questions 22-27

Robert Groff, an equity analyst, is preparing a report on Crux Corp. As part of his report, Groff makes a comparative financial analysis between Crux and its two main competitors, Rolby Corp. and Mikko Inc. Crux and Mikko report under US GAAP and Rolby reports under IFRS.

Groff gathers information on Crux, Rolby, and Mikko. The relevant financial information on the three companies, and on the industry, is provided in Exhibit 8.

Exhibit 1: Selected Financial Information (millions of US dollars)

A. Balance Sheets and Income Statements

	Crux	Rolby	Mikko
Inventory valuation method	LIFO	FIFO	LIFO
From the Balance Sheets			
As of 31 December 2018			
Inventory, gross	480	620	510
Valuation allowance	20	25	14
Inventory, net	460	595	496
Total debt	1,122	850	732
Total shareholders' equity	2,543	2,403	2,091
As of 31 December 2017			
Inventory, gross	465	602	401
Valuation allowance	23	15	12
Inventory, net	442	587	389
From the Income Statements			
Year Ended 31 December 2018			
Revenues	4,609	5,442	3,503
Cost of goods sold ^a	3,120	3,782	2,550
Net income	229	327	205
^a Charges included in cost of goods sold for inventory write-downs*	13	15	15

B. LIFO Reserve

LIFO Reserve			
As of 31 December 2018	55	0	77
As of 31 December 2017	72	0	50
As of 31 December 2016	96	0	43

B. LIFO Reserve			
Tax Rate			
Effective tax rate	30%	30%	30%

C. Industry Information			
	2018	2017	2016
Raw materials price index	112	105	100
Finished goods price index	114	106	100

* This does not match the change in the inventory valuation allowance because the valuation allowance is reduced to reflect the valuation allowance attached to items sold and increased for additional necessary write-downs.

To compare the financial performance of the three companies, Groff decides to convert LIFO figures into FIFO figures, and adjust figures to assume no valuation allowance is recognized by any company.

22. Crux's inventory turnover ratio computed as of 31 December 2018, after the adjustments suggested by Groff, is *closest* to:
- A. 5.67.
 - B. 5.83.
 - C. 6.13.
23. Rolby's net profit margin for the year ended 31 December 2018, after the adjustments suggested by Groff, is *closest* to:
- A. 6.01 percent.
 - B. 6.20 percent.
 - C. 6.28 percent.
24. Compared with its unadjusted debt-to-equity ratio, Mikko's debt-to-equity ratio as of 31 December 2018, after the adjustments suggested by Groff, is:
- A. lower.
 - B. higher.
 - C. the same.
25. Which company's gross profit margin would best reflect current costs of the industry?
- A. Crux.
 - B. Rolby.
 - C. Mikko.
26. Would Rolby's valuation method show a higher gross profit margin than Crux's under an inflationary, a deflationary, or a stable price scenario?
- A. Stable
 - B. Inflationary

C. Deflationary

27. Which group of ratios usually appears more favorable with an inventory write-down?

A. Activity ratios

B. Solvency ratios

C. Profitability ratios

The following information relates to questions 28-37

ZP Corporation is a (hypothetical) multinational corporation headquartered in Japan that trades on numerous stock exchanges. ZP prepares its consolidated financial statements in accordance with US GAAP. Excerpts from ZP's 2018 annual report are presented below.

Exhibit 1: ZP Corporation Financial Statements

A. Consolidated Balance Sheets (millions in Japanese yen)

31 December	2017	2018
Current Assets		
Cash and cash equivalents	JPY542,849	JPY814,760
⋮	⋮	⋮
Inventories	608,572	486,465
⋮	⋮	⋮
Total current assets	4,028,742	3,766,309
⋮	⋮	⋮
Total assets	JPY10,819,440	JPY9,687,346
⋮	⋮	⋮
Total current liabilities	JPY3,980,247	JPY3,529,765
⋮	⋮	⋮
Total long-term liabilities	2,663,795	2,624,002
Minority interest in consolidated subsidiaries	218,889	179,843
Total shareholders' equity	3,956,509	3,353,736
Total liabilities and shareholders' equity	JPY10,819,440	JPY9,687,346

B. Consolidated Statements of Income (millions in Japanese yen)

For the years ended 31 December	2016	2017	2018
Net revenues			
Sales of products	JPY7,556,699	JPY8,273,503	JPY6,391,240
Financing operations	425,998	489,577	451,950
	7,982,697	8,763,080	6,843,190

B. Consolidated Statements of Income (millions in Japanese yen)			
For the years ended 31			
December	2016	2017	2018
Cost and expenses			
Cost of products sold	6,118,742	6,817,446	5,822,805
Cost of financing operations	290,713	356,005	329,128
Selling, general and administrative	827,005	832,837	844,927
⋮	⋮	⋮	⋮
Operating income (loss)	746,237	756,792	−153,670
⋮	⋮	⋮	⋮
Net income	JPY548,011	JPY572,626	−JPY145,646

Exhibit 2: Excerpt from the 2018 Annual Report, Selected Disclosures**Management Discussion and Analysis of Financial Condition and Results of Operations**

Cost reduction efforts were offset by increased prices of raw materials, other production materials and parts. Inventories decreased during fiscal 2018 by JPY122.1 billion, or 20.1 percent, to JPY486.5 billion. This reflects the impacts of decreased sales volumes and fluctuations in foreign currency translation rates.

Management and Corporate Information**Risk Factors****Industry and Business Risks**

The worldwide market for our products is highly competitive. ZP faces intense competition from other manufacturers in the respective markets in which it operates. Competition has intensified due to the worldwide deterioration in economic conditions. In addition, competition is likely to further intensify because of continuing globalization, possibly resulting in industry reorganization. Factors affecting competition include product quality and features, the amount of time required for innovation and development, pricing, reliability, safety, economy in use, customer service and financing terms. Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure.

ZP's ability to adequately respond to the recent rapid changes in the industry and to maintain its competitiveness will be fundamental to its future success in maintaining and expanding its market share in existing and new markets.

Notes to Consolidated Financial Statements**2. Summary of significant accounting policies:**

Inventories. Inventories are valued at cost, not in excess of market. Cost is determined on the "average-cost" basis, except for the cost of finished products carried by certain subsidiary companies, which is determined on a last-in, first-out (LIFO) basis. Inventories valued on the LIFO basis totaled JPY94,578 million and JPY50,037 million at 31 December 2017 and 2018, respectively. Had the FIFO basis been used for those companies using the LIFO basis, inventories would have been JPY10,120 million and JPY19,660 million higher than reported at 31 December 2017 and 2018, respectively.

9. Inventories:

Inventories consist of the following:

31 December (millions in Japanese yen)	2017	2018
Finished goods	JPY 403,856	JPY 291,977
Raw materials	99,869	85,966
Work in process	79,979	83,890
Supplies and other	24,868	24,632
	JPY 608,572	JPY 486,465

28. The management discussion and analysis (MD&A) indicated that the prices of raw material, other production materials, and parts increased. Based on the inventory valuation methods described in Note 2, which inventory classification would *least accurately* reflect current prices?

- A. Raw materials
- B. Finished goods
- C. Work in process

29. According to Exhibit 10, the 2018 Annual Report, if the company had used the FIFO inventory valuation method instead of the LIFO inventory valuation method for a portion of its inventory, the 2017 inventory value would be *closest* to:
- A. JPY104,698 million.
 - B. JPY506,125 million.
 - C. JPY618,692 million.
30. If ZP had prepared its financial statement in accordance with IFRS, the inventory turnover ratio (using average inventory) for 2018 would be:
- A. lower.
 - B. higher.
 - C. the same.
31. Inventory levels decreased from 2017 to 2018 for all of the following reasons *except*:
- A. LIFO liquidation.
 - B. decreased sales volume.
 - C. fluctuations in foreign currency translation rates.
32. Which observation is *most likely* a result of looking only at the information reported in Exhibit 10, Note 9?
- A. Increased competition has led to lower unit sales.
 - B. There have been significant price increases in supplies.
 - C. Management expects a further downturn in sales during 2019.
33. Exhibit 10, Note 2, indicates that “inventories valued on the LIFO basis totaled JPY94,578 million and JPY50,037 million at 31 December 2017 and 2018, respectively.” Based on this, the LIFO reserve should *most likely*:
- A. increase.
 - B. decrease.
 - C. remain the same.
34. In Exhibit 10, the Industry and Business Risk excerpt states that, “Increased competition may lead to lower unit sales and excess production capacity and excess inventory. This may result in a further downward price pressure.” The downward price pressure could lead to inventory that is valued above current market prices or net realizable value. Any write-downs of inventory are *least likely* to have a significant effect on the inventory valued using:
- A. weighted average cost.
 - B. first-in, first-out (FIFO).
 - C. last-in, first-out (LIFO).
35. During periods of rising inventory unit costs, a company using the FIFO method

rather than the LIFO method will report a lower:

- A. current ratio.
 - B. inventory turnover.
 - C. gross profit margin.
36. Compared with a company that uses the FIFO method, during a period of rising unit inventory costs, a company using the LIFO method will *most likely* appear more:
- A. liquid.
 - B. efficient.
 - C. profitable.
37. In a period of declining inventory unit costs and constant or increasing inventory quantities, which inventory method is *most likely* to result in a higher debt-to-equity ratio?
- A. LIFO
 - B. FIFO
 - C. Weighted average cost
-

SOLUTIONS

1. A is correct. IFRS allow the inventories of producers and dealers of agricultural and forest products, agricultural produce after harvest, and minerals and mineral products to be carried at net realizable value even if above historical cost. (US GAAP treatment is similar.)
2. B is correct. Under IFRS, the reversal of write-downs is required if net realizable value increases. The inventory will be reported on the balance sheet at GBP1,000,000. The inventory is reported at the lower of cost or net realizable value.
3. A is correct. IFRS requires the reversal of inventory write-downs if net realizable values increase; US GAAP does not permit the reversal of write-downs. Therefore, Fernando's inventory balance would be higher under IFRS.
4. C is correct. Activity ratios (e.g., inventory turnover and total asset turnover) will be positively affected by a write-down to net realizable value because the asset base (denominator) is reduced. On the balance sheet, the inventory carrying amount is written down to its net realizable value and the loss in value (expense) is generally reflected on the income statement in the cost of goods sold, thus reducing gross profit, operating profit, and net income.
5. A is correct. Zimt uses the FIFO method, so its cost of sales represents units purchased at a (no longer available) lower price. Nutmeg uses the LIFO method, so its cost of sales is approximately equal to the current replacement cost of inventory.
6. B is correct. Nutmeg uses the LIFO method, and thus some of the inventory on the balance sheet was purchased at a (no longer available) lower price. Zimt uses the FIFO method, so the carrying value on the balance sheet represents the most recently purchased units and thus approximates the current replacement cost.
7. B is correct. In a declining price environment, the newest inventory is the lowest-cost inventory. In such circumstances, using the LIFO method (selling the newer, cheaper inventory first) will result in lower cost of sales and higher profit.
8. B is correct. In a rising price environment, inventory balances will be higher for the company using the FIFO method. Accounts payable are based on amounts due to suppliers, not the amounts accrued based on inventory accounting.
9. C is correct. The write-down reduced the value of inventory and increased cost of sales in 2017. The higher numerator and lower denominator mean that the inventory turnover ratio as reported was too high. Gross margin and the current ratio were both too low.
10. A is correct. The reversal of the write-down shifted the cost of sales from 2018 to 2017. The 2017 cost of sales was higher because of the write-down, and the 2018 cost of sales was lower because of the reversal of the write-down. As a result, the reported 2018 profits were overstated. Inventory balance in 2018 is the same because the write-down and reversal cancel each other out. Cash flow from operations is not affected by the non-cash write-down, but the higher profits in 2018 likely resulted in higher taxes and thus lower cash flow from operations.
11. B is correct. LIFO will result in lower inventory and higher cost of sales. Gross margin (a profitability ratio) will be lower, the current ratio (a liquidity ratio) will

be lower, and inventory turnover (an efficiency ratio) will be higher.

12. A is correct. LIFO will result in lower inventory and higher cost of sales in periods of rising costs compared to FIFO. Consequently, LIFO results in a lower gross profit margin than FIFO.
13. B is correct. During periods of rising prices, using the LIFO method increases cost of sales relative to the FIFO method, thus reducing profits and the taxes thereon.
14. A is correct. US GAAP does not permit inventory write-downs to be reversed.
15. C is correct. The storage costs for inventory awaiting shipment to customers are not costs of purchase, costs of conversion, or other costs incurred in bringing the inventories to their present location and condition and are not included in inventory. The storage costs for the chocolate liquor occur during the production process and are thus part of the conversion costs. Excise taxes are part of the purchase cost.
16. C is correct. The carrying amount of inventories under FIFO will more closely reflect current replacement values because inventories are assumed to consist of the most recently purchased items. FIFO is an acceptable, but not preferred, method under IFRS. Weighted average cost, not FIFO, is the cost formula that allocates the same per unit cost to both cost of sales and inventory.
17. B is correct. $\text{Inventory turnover} = \text{Cost of sales} / \text{Average inventory} = 41,043 / 7,569.5 = 5.42$. Average inventory is $(8,100 + 7,039) / 2 = 7,569.5$.
18. B is correct. For comparative purposes, the choice of a competitor that reports under IFRS is requested because LIFO is permitted under US GAAP.
19. A is correct. The carrying amount of the ending inventory may differ because the perpetual system will apply LIFO continuously throughout the year, liquidating layers as sales are made. Under the periodic system, the sales will start from the last layer in the year. Under FIFO, the sales will occur from the same layers regardless of whether a perpetual or periodic system is used. Specific identification identifies the actual products sold and remaining in inventory, and there will be no difference under a perpetual or periodic system.
20. A is correct. Gross profit will most likely increase by CHF7,775. The net realizable value has increased and now exceeds the cost. The write-down from 2017 can be reversed. The write-down in 2017 was 9,256 $[92,560 \times (4.05 - 3.95)]$. IFRS require the reversal of any write-downs for a subsequent increase in value of inventory previously written down. The reversal is limited to the lower of the subsequent increase or the original write-down. Only 77,750 kilograms remain in inventory; the reversal is $77,750 \times (4.05 - 3.95) = 7,775$. The amount of any reversal of a write-down is recognized as a reduction in cost of sales. This reduction results in an increase in gross profit.
21. C is correct. Using the FIFO method to value inventories when prices are rising will allocate more of the cost of goods available for sale to ending inventories (the most recent purchases, which are at higher costs, are assumed to remain in inventory) and less to cost of sales (the oldest purchases, which are at lower costs, are assumed to be sold first).
22. B is correct. Crux's adjusted inventory turnover ratio must be computed using cost of goods sold (COGS) under FIFO and excluding charges for increases in valuation allowances.

COGS (adjusted)

= COGS (LIFO method) – Charges included in cost of goods sold for inventory write-downs – Change in LIFO reserve

= USD3,120 million – 13 million – (55 million – 72 million)

= USD3,124 million

Note: Minus the change in LIFO reserve is equivalent to plus the decrease in LIFO reserve. The adjusted inventory turnover ratio is computed using average inventory under FIFO.

Ending inventory (FIFO) = Ending inventory (LIFO) + LIFO reserve

Ending inventory 2018 (FIFO) = USD480 + 55 = USD535

Ending inventory 2017 (FIFO) = USD465 + 72 = USD537

Average inventory = (USD535 + 537)/2 = USD536

Therefore, adjusted inventory turnover ratio equals:

Inventory turnover ratio = COGS/Average inventory = USD3,124/USD536 = 5.83

23. B is correct. Rolby's adjusted net profit margin must be computed using net income (NI) under FIFO and excluding charges for increases in valuation allowances.

NI (adjusted)

= NI (FIFO method) + Charges, included in cost of goods sold for inventory write-downs, after tax

= USD327 million + 15 million × (1 – 30%)

= USD337.5 million

Therefore, adjusted net profit margin equals:

Net profit margin = NI/Revenues = USD337.5/USD5,442 = 6.20%.

24. A is correct. Mikko's adjusted debt-to-equity ratio is lower because the debt (numerator) is unchanged and the adjusted shareholders' equity (denominator) is higher. The adjusted shareholders' equity corresponds to shareholders' equity under FIFO, excluding charges for increases in valuation allowances. Therefore, adjusted shareholders' equity is higher than reported (unadjusted) shareholders' equity.
25. C is correct. Mikko's and Crux's gross margin ratios would better reflect the current gross margin of the industry than Rolby because both use LIFO. LIFO recognizes as cost of goods sold the cost of the most recently purchased units; therefore, it better reflects replacement cost. However, Mikko's gross margin ratio best reflects the current gross margin of the industry because Crux's LIFO reserve is decreasing. This could reflect a LIFO liquidation by Crux which would distort gross profit margin.
26. B is correct. The FIFO method shows a higher gross profit margin than the LIFO method in an inflationary scenario, because FIFO allocates to cost of goods sold the cost of the oldest units available for sale. In an inflationary environment, these units are the ones with the lowest cost.

27. A is correct. An inventory write-down increases the cost of sales and reduces profit and reduces the carrying value of inventory and assets. This has a negative effect on profitability and solvency ratios. However, activity ratios appear positively affected by a write-down because the asset base, whether total assets or inventory (denominator), is reduced. The numerator, sales, in total asset turnover is unchanged, and the numerator, cost of sales, in inventory turnover is increased. Thus, turnover ratios are higher and appear more favorable as the result of the write-down.
28. B is correct. Finished goods least accurately reflect current prices because some of the finished goods are valued under the last-in, first-out (“LIFO”) basis. The costs of the newest units available for sale are allocated to cost of goods sold, leaving the oldest units (at lower costs) in inventory. ZP values raw materials and work in process using the weighted average cost method. While not fully reflecting current prices, some inflationary effect will be included in the inventory values.
29. C is correct. FIFO inventory = Reported inventory + LIFO reserve = JPY608,572 + 10,120 = JPY618,692. The LIFO reserve is disclosed in Note 2 of the notes to consolidated financial statements.
30. A is correct. The inventory turnover ratio would be lower. The average inventory would be higher under FIFO and cost of products sold would be lower by the increase in LIFO reserve. LIFO is not permitted under IFRS.
- Inventory turnover ratio = Cost of products sold ÷ Average inventory
- 2018 inventory turnover ratio as reported = 10.63
- = JPY5,822,805 / [(608,572 + 486,465) / 2].
- 2018 inventory turnover ratio adjusted to FIFO as necessary = 10.34
- = [JPY5,822,805 – (19,660 – 10,120)] / [(608,572 + 10,120 + 486,465 + 19,660) / 2].
31. A is correct. No LIFO liquidation occurred during 2018; the LIFO reserve increased from JPY10,120 million in 2017 to JPY19,660 million in 2018. Management stated in the MD&A that the decrease in inventories reflected the impact of decreased sales volumes and fluctuations in foreign currency translation rates.
32. C is correct. Finished goods and raw materials inventories are lower in 2018 when compared to 2017. Reduced levels of inventory typically indicate an anticipated business contraction.
33. B is correct. The decrease in LIFO inventory in 2018 would typically indicate that more inventory units were sold than produced or purchased. Accordingly, one would expect a liquidation of some of the older LIFO layers and the LIFO reserve to decrease. In actuality, the LIFO reserve *increased* from JPY10,120 million in 2017 to JPY19,660 million in 2018. This is not to be expected and is likely caused by the increase in prices of raw materials, other production materials, and parts of foreign currencies as noted in the MD&A. An analyst should seek to confirm this explanation.
34. B is correct. If prices have been decreasing, write-downs under FIFO are least likely to have a significant effect because the inventory is valued at closer to the new, lower prices. Typically, inventories valued using LIFO are less likely to incur inventory write-downs than inventories valued using weighted average cost or FIFO. Under LIFO, the *oldest* costs are reflected in the inventory carrying value on the balance sheet. Given increasing inventory costs, the inventory carry-



ing values under the LIFO method are already conservatively presented at the oldest and lowest costs. Thus, it is far less likely that inventory write-downs will occur under LIFO; and if a write-down does occur, it is likely to be of a lesser magnitude.

35. B is correct. During a period of rising inventory costs, a company using the FIFO method will allocate a lower amount to cost of goods sold and a higher amount to ending inventory as compared with the LIFO method. The inventory turnover ratio is the ratio of cost of sales to ending inventory. A company using the FIFO method will produce a lower inventory turnover ratio as compared with the LIFO method. The current ratio (current assets/current liabilities) and the gross profit margin [$\text{gross profit/sales} = (\text{sales less cost of goods sold})/\text{sales}$] will be higher under the FIFO method than under the LIFO method in periods of rising inventory unit costs.
36. B is correct. During a period of rising inventory prices, a company using the LIFO method will have higher cost of goods sold and a lower inventory compared with a company using the FIFO method. The inventory turnover ratio will be higher for the company using the LIFO method, thus making it appear more efficient. Current assets and gross profit margin will be lower for the company using the LIFO method, thus making it appear to be less liquid and less profitable.
37. B is correct. In an environment of declining inventory unit costs and constant or increasing inventory quantities, FIFO (in comparison with weighted average cost or LIFO) will have higher cost of goods sold and lower net income and inventory. Because both inventory and net income are lower, total equity is lower, resulting in a higher debt-to-equity ratio.

LEARNING MODULE

7

Analysis of Long-Term Assets

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	compare the financial reporting of the following types of intangible assets: purchased, internally developed, and acquired in a business combination
☐	explain and evaluate how impairment and derecognition of property, plant, and equipment and intangible assets affect the financial statements and ratios
☐	analyze and interpret financial statement disclosures regarding property, plant, and equipment and intangible assets

INTRODUCTION

1

Long-term assets such as property, plant, and equipment and intangibles typically account for most issuers' assets and are employed to generate economic benefits for many years. While an "economic" balance sheet would include a wide range of assets such as a company's reputation and its trained, experienced workforce, "accounting" balance sheets prepared under IFRS and US GAAP permit the recognition of a narrow range of assets. Once a long-lived asset is recognized, either the cost or revaluation models are used for measurement, while US GAAP requires the cost model. The choice of different methods and varying accounting policies for long-lived assets can create challenges for analysts comparing companies.

LEARNING MODULE OVERVIEW



- IFRS requires expensing research costs but allows development costs (not only software development costs) to be capitalized under certain conditions. Generally, US GAAP requires that both research and development costs be expensed; however, certain development costs related to software must be capitalized.
- When one company acquires another company, the transaction is accounted for using the acquisition method of accounting in which the company identified as the acquirer allocates the purchase price

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

to each asset acquired (and each liability assumed) on the basis of its fair value. Any excess of the purchase price over the fair value of net identifiable assets acquired is recorded as goodwill.

- The capitalized costs of long-lived tangible assets and of intangible assets with finite useful lives are allocated to expense in subsequent periods over their useful lives. For tangible assets, this process is referred to as depreciation, and for intangible assets, it is referred to as amortization.
- Long-lived tangible assets and intangible assets with finite useful lives are reviewed for impairment whenever changes in events or circumstances indicate that the carrying amount of an asset may not be recoverable.
- Intangible assets with an indefinite useful life are not amortized. Instead, they are reviewed for impairment annually.
- In contrast with depreciation and amortization charges, which serve to allocate the cost of a long-lived asset over its useful life, impairment charges reflect an unexpected decline in the fair value of an asset to an amount lower than its carrying amount.
- IFRS permit impairment losses to be reversed, with the reversal reported in profit. US GAAP do not permit the reversal of impairment losses.
- The gain or loss on the sale of long-lived assets is computed as the sale proceeds minus the carrying amount of the asset at the time of sale.

2

ACQUISITION OF INTANGIBLE ASSETS



compare the financial reporting of the following types of intangible assets: purchased, internally developed, and acquired in a business combination

Intangible assets are non-monetary assets lacking physical substance. Intangible assets include items that involve exclusive rights, such as patents, copyrights, trademarks, and franchises. Under IFRS, identifiable intangible assets must meet three definitional criteria. They must be (1) identifiable (either capable of being separated from the entity or arising from contractual or legal rights), (2) under the control of the company, and (3) expected to generate future economic benefits. In addition, two recognition criteria must be met: (1) It is probable that the expected future economic benefits of the asset will flow to the company, and (2) the cost of the asset can be reliably measured. Goodwill, which is not considered an identifiable intangible asset,¹ arises when one company purchases another and the acquisition price exceeds the fair value of the net identifiable assets (both the tangible assets and the identifiable intangible assets, minus liabilities) acquired.

¹ The IFRS definition of an intangible asset as an “identifiable non-monetary asset without physical substance” applies to intangible assets not specifically dealt with in standards other than International Accounting Standards (IAS) 38. The definition of intangible assets under US GAAP—“assets (other than financial assets) that lack physical substance”—includes goodwill in the definition of an intangible asset.

Accounting for an intangible asset depends on how it is acquired. The following sections describe accounting for intangible assets obtained in three ways: purchased in situations other than business combinations, developed internally, and acquired in business combinations.

Intangible Assets Purchased in Situations Other Than Business Combinations

Intangible assets purchased in situations other than business combinations, such as buying a patent, are treated at acquisition the same as long-lived tangible assets; they are recorded at their fair value when acquired, which is assumed to be equivalent to the purchase price. If several intangible assets are acquired as part of a group, the purchase price is allocated to each asset on the basis of its fair value.

In deciding how to treat individual intangible assets for analytical purposes, analysts are particularly aware that companies must use a substantial amount of judgment and numerous assumptions to determine the fair value of individual intangible assets. For analysis, therefore, understanding the types of intangible assets acquired can often be more useful than focusing on the values assigned to the individual assets. In other words, an analyst would typically be more interested in understanding what assets a company acquired (e.g., franchise rights) than in the precise portion of the purchase price a company allocated to each asset. Understanding the types of assets a company acquires can offer insights into the company's strategic direction and future operating potential.

Intangible Assets Developed Internally

In contrast with the treatment of construction costs of tangible assets, the costs to internally develop intangible assets are generally expensed when incurred. In some situations, however, the costs incurred to internally develop an intangible asset are capitalized. The general analytical issues related to the capitalizing-versus-expensing decision apply here—namely, comparability across companies and the effect on an individual company's trend analysis.

The general requirement that costs to internally develop intangible assets be expensed should be compared with capitalizing the cost of acquiring intangible assets in situations other than business combinations. Because costs associated with internally developing intangible assets are usually expensed, a company that has internally developed intangible assets, such as patents, copyrights, or brands through expenditures on R&D or advertising, will recognize a lower amount of assets than a company that has obtained intangible assets through external purchase. In addition, on the statement of cash flows, costs of internally developing intangible assets are classified as operating cash outflows whereas costs of acquiring intangible assets are classified as investing cash outflows. Differences in strategy (developing versus acquiring intangible assets) can thus impact financial ratios.

IFRS requires that expenditures on research (or during the research phase of an internal project) be expensed rather than capitalized as an intangible asset.² Research is defined as “original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding.”³ The “research phase of an internal project” refers to the period during which a company cannot demonstrate that an intangible asset is being created—for example, the search for alternative materials or systems to use in a production process. In contrast with the

² IAS 38, *Intangible Assets*.

³ IAS 38, *Intangible Assets*, paragraph 8, *Definitions*.

treatment of research-phase expenditures, IFRS allow companies to recognize an intangible asset arising from development expenditures (or the development phase of an internal project) if certain criteria are met, including a demonstration of the technical feasibility of completing the intangible asset and the intent to use or sell the asset. Development is defined as “the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services before the start of commercial production or use.”⁴

Generally, US GAAP requires that both research and development costs be expensed as incurred but require capitalization of certain costs related to software development.⁵ Costs incurred to develop a software product for sale are expensed until the product’s technological feasibility is established and are capitalized thereafter. Similarly, companies expense costs related to the development of software for internal use until it is probable that the project will be completed and that the software will be used as intended. Thereafter, development costs are capitalized. The probability that the project will be completed is easier to demonstrate than is technological feasibility. The capitalized costs, related directly to developing software for sale or internal use, include the costs of employees who help build and test the software. The treatment of software development costs under US GAAP is similar to the treatment of all costs of internally developed intangible assets under IFRS.

EXAMPLE 1

Software Development Costs

REH AG, a fictional company that reports under IFRS, incurs expenditures of EUR1,000 per month during the fiscal year ended 31 December 2019 to develop software for internal use.

1. What is the accounting impact of the company being able to demonstrate that the software met the criteria for recognition as an intangible asset on 1 February versus 1 December?

Solution:

If the company is able to demonstrate that the software met the criteria for recognition as an intangible asset on 1 February, the company would recognize the EUR1,000 expended in January as an expense on the income statement for the fiscal year ended 31 December 2019. The other EUR11,000 of expenditures would be recognized as an intangible asset (on the balance sheet). Alternatively, if the company is not able to demonstrate that the software met the criteria for recognition as an intangible asset until 1 December, the company would recognize the EUR11,000 expensed in January through November as an expense on the income statement for the fiscal year ended 31 December 2019, with the other EUR1,000 of expenditures recognized as an intangible asset.

⁴ IAS 38, *Intangible Assets*, paragraph 8, *Definitions*.

⁵ Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC), Section 350-40-25, *Intangibles—Goodwill and Other – Internal-Use Software – Recognition*; and FASB ASC, Section 985-20-25, *Software – Costs of Software to be Sold, Leased, or Marketed – Recognition*, specify US GAAP accounting for software development costs for software for internal use and for software to be sold, respectively.

2. 2. How would the treatment of expenditures differ if the company reported under US GAAP and it had established in 2018 that the project was likely to be completed and the software used to perform the function intended?

Solution:

Under US GAAP, the company would capitalize the entire EUR12,000 spent to develop software for internal use.

Intangible Assets Acquired in a Business Combination

When one company acquires another company, the transaction is accounted for using the acquisition method of accounting.⁶ Under the acquisition method, the company identified as the acquirer allocates the purchase price to each asset acquired (and each liability assumed) on the basis of its fair value. If the purchase price exceeds the sum of the amounts that can be allocated to individual identifiable assets and liabilities, the excess is recorded as goodwill. Goodwill cannot be identified separately from the business as a whole.

Under IFRS, the acquired individual assets include identifiable intangible assets that meet the definitional and recognition criteria.⁷ Otherwise, if the item is acquired in a business combination and cannot be recognized as a tangible or identifiable intangible asset, it is recognized as goodwill. Under US GAAP, there are two criteria to judge whether an intangible asset acquired in a business combination should be recognized separately from goodwill: The asset must be either an item arising from contractual or legal rights or an item that can be separated from the acquired company. Examples of intangible assets treated separately from goodwill include the intangible assets previously mentioned that involve exclusive rights (patents, copyrights, franchises, licenses), as well as such items as internet domain names and video and audiovisual materials.

Exhibit 1 describes how AB InBev allocated the USD103 billion purchase consideration in its 2016 acquisition of SABMiller Group. The combined company was renamed Anheuser-Busch InBev SA/NV. The majority of the intangible asset valuation relates to brands with indefinite life (USD19.9 billion of the USD20.0 billion total). Of USD63.0 billion total assets acquired, assets to be divested were valued at USD24.8 billion and assets to be held for were valued at USD38.2 billion. In total, intangible assets represent 52 percent of the total assets to be held for use. In addition, USD74.1 billion of goodwill was recognized in the transaction.

Exhibit 1: Acquisition of Intangible Assets through a Business Combination

Excerpt from the 2016 Annual Report of AB InBev:

“On 10 October 2016, AB InBev announced the ... successful completion of the business combination with the former SABMiller Group (“SAB”).

“The transaction resulted in 74.1 billion US dollar of goodwill provisionally allocated primarily to the businesses in Colombia, Ecuador, Peru, Australia, South Africa and other African, Asia Pacific and Latin American countries. The factors that contributed to the recognition of goodwill include the acquisition of an assembled workforce and the premiums paid for cost synergies expected to be achieved in SABMiller. Management’s

⁶ Both IFRS and US GAAP require the use of the acquisition method in accounting for business combinations (IFRS 3 and FASB ASC, Section 805).

⁷ As previously described, the definitional criteria are identifiability, control by the company, and expected future benefits. The recognition criteria are probable flows of the expected economic benefits to the company and measurability.

assessment of the future economic benefits supporting recognition of this goodwill is in part based on expected savings through the implementation of AB InBev best practices such as, among others, a zero based budgeting program and initiatives that are expected to bring greater efficiency and standardization, generate cost savings and maximize purchasing power. Goodwill also arises due to the recognition of deferred tax liabilities in relation to the preliminary fair value adjustments on acquired intangible assets for which the amortization does not qualify as a tax deductible expense. None of the goodwill recognized is deductible for tax purposes.

“The majority of the intangible asset valuation relates to brands with indefinite life, valued for a total amount of 19.9 billion US dollar. The valuation of the brands with indefinite life is based on a series of factors, including the brand history, the operating plan and the countries in which the brands are sold. The fair value of brands was estimated by applying a combination of known valuation methodologies, such as the royalty relief and excess earnings valuation approaches.

“The intangibles with an indefinite life mainly include the Castle and Carling brand families in Africa, the Aguila and Poker brand families in Colombia, the Cristal and Pilsner brand families in Ecuador, and the Carlton brand family in Australia.

“Assets held for sale were recognized in relation to the divestiture of SABMiller’s interests in the MillerCoors LLC joint venture and certain of SABMiller’s portfolio of Miller brands outside of the US to Molson Coors Brewing company; the divestiture of SABMiller’s European premium brands to Asahi Group Holdings, Ltd and the divestiture of SABMiller’s interest in China Resources Snow Breweries Ltd. to China Resources Beer (Holdings) Co. Ltd.”

The following is a summary of the provisional allocation of AB InBev’s purchase price of SABMiller:

Assets	USD million
Property, plant and equipment	9,060
Intangible assets	20,040
Investment in associates	4,386
Inventories	977
Trade and other receivables	1,257
Cash and cash equivalents	1,410
Assets held for sale	24,805
<i>All other assets</i>	<i>1,087</i>
<i>Total assets</i>	<i>63,022</i>
<i>Total liabilities</i>	<i>–27,769</i>
Net identified assets and liabilities	35,253
Non-controlling interests	–6,200
Goodwill on acquisition	74,083
Purchase consideration	103,136

Table is excerpted from the company’s 2016 Annual Report. Portions of detail are omitted, and subtotals are shown in italics.

Source: AB InBev 2016 Annual Report, 82–85.

IMPAIRMENT AND DERECOGNITION OF ASSETS

3

- ☐ explain and evaluate how impairment and derecognition of property, plant, and equipment and intangible assets affect the financial statements and ratios

In contrast with depreciation and amortization charges, which serve to allocate the depreciable cost of a long-lived asset over its useful life, impairment charges reflect an unanticipated decline in the value of an asset. Both IFRS and US GAAP require companies to write down the carrying amount of impaired assets. Impairment reversals for identifiable, long-lived assets are permitted under IFRS but typically not under US GAAP.

An asset is considered to be impaired when its carrying amount exceeds its recoverable amount. Although IFRS and US GAAP define recoverability differently (as described below), in general, impairment losses are recognized when the asset's carrying amount is not recoverable. The following paragraphs describe accounting for impairment for different categories of assets.

Impairment of Property, Plant, and Equipment

Accounting standards do not require that property, plant, and equipment be tested annually for impairment. Rather, at the end of each reporting period (generally, a fiscal year), a company assesses whether there are indications of asset impairment. If there is no indication of impairment, the asset is not tested for impairment. If there is an indication of impairment, such as evidence of obsolescence, decline in demand for products, or technological advancements, the recoverable amount of the asset should be measured in order to test for impairment. For property, plant, and equipment, impairment losses are recognized when the asset's carrying amount is not recoverable (i.e. the carrying amount is more than the recoverable amount). The amount of the impairment loss will reduce the carrying amount of the asset on the balance sheet and will reduce net income on the income statement. The impairment loss is a non-cash item and will not affect cash from operations.

IFRS and US GAAP differ somewhat both in the guidelines for determining that impairment has occurred and in the measurement of an impairment loss. Under IAS 36, an impairment loss is measured as the excess of carrying amount over the recoverable amount of the asset. The recoverable amount of an asset is defined as "the higher of its fair value less costs to sell and its value in use." Value in use is based on the present value of expected future cash flows. Under US GAAP, assessing recoverability is separate from measuring the impairment loss. The carrying amount of an asset "group" is considered not recoverable when it exceeds the undiscounted expected future cash flows of the group. If the asset's carrying amount is considered not recoverable, the impairment loss is measured as the difference between the asset's fair value and carrying amount.

EXAMPLE 2

Impairment of Property, Plant, and Equipment

Sussex, a fictional manufacturing company in the United Kingdom, owns a machine it uses to produce a single product. The demand for the product has declined substantially since the introduction of a competing product. The company has assembled the following information with respect to the machine:

Carrying amount	GBP18,000
Undiscounted expected future cash flows	GBP19,000
Present value of expected future cash flows	GBP16,000
Fair value if sold	GBP17,000
Costs to sell	GBP2,000

1. 1. Under IFRS, what would the company report for the machine?

Solution:

Under IFRS, the company would compare the carrying amount (GBP18,000) with the higher of its fair value less costs to sell (GBP15,000) and its value in use (GBP16,000). The carrying amount exceeds the value in use, the higher of the two amounts, by GBP2,000. The machine would be written down to the recoverable amount of £16,000, and a loss of £2,000 would be reported in the income statement. The carrying amount of the machine is now GBP16,000. A new depreciation schedule based on the carrying amount of GBP16,000 would be developed.

2. 2. Under US GAAP, what would the company report for the machine?

Solution:

Under US GAAP, the carrying amount (GBP18,000) is compared with the undiscounted expected future cash flows (GBP19,000). The carrying amount is less than the undiscounted expected future cash flows, so the carrying amount is considered recoverable. The machine would continue to be carried at GBP18,000, and no loss would be reported.

In Example 2, a write down in the value of a piece of property, plant, and equipment occurred under IFRS but not under US GAAP. In Example 3, a write down occurs under both IFRS and US GAAP.

EXAMPLE 3

Impairment of Property, Plant, and Equipment

Essex, a fictional manufacturing company in the United Kingdom, owns a machine it uses to produce a single product. The demand for the product has declined substantially since the introduction of a competing product. The company has assembled the following information with respect to the machine:

Carrying amount	GBP18,000
Undiscounted expected future cash flows	GBP16,000
Present value of expected future cash flows	GBP14,000
Fair value if sold	GBP10,000
Costs to sell	GBP2,000

1. 1. Under IFRS, what would the company report for the machine?

Solution:

Under IFRS, the company would compare the carrying amount (GBP18,000) with the higher of its fair value less costs to sell (GBP8,000) and its value in use (GBP14,000). The carrying amount exceeds the value in use, the higher

of the two amounts, by GBP4,000. The machine would be written down to the recoverable amount of GBP14,000, and a loss of GBP4,000 would be reported in the income statement. The carrying amount of the machine is now GBP14,000. A new depreciation schedule based on the carrying amount of GBP14,000 would be developed.

2. 2. Under US GAAP, what would the company report for the machine?

Solution:

Under US GAAP, the carrying amount (GBP18,000) is compared with the undiscounted expected future cash flows (GBP16,000). The carrying amount exceeds the undiscounted expected future cash flows, so the carrying amount is considered not recoverable. The machine would be written down to fair value of GBP10,000, and a loss of GBP8,000 would be reported in the income statement. The carrying amount of the machine is now GBP10,000. A new depreciation schedule based on the carrying amount of GBP10,000 would be developed.

Example 3 shows that the write down to value in use under IFRS can be less than the write down to fair value under US GAAP. The difference in recognition of impairment losses is ultimately reflected in differences in book value of equity.

Impairment of Intangible Assets with a Finite Life

Intangible assets with a finite life are amortized (carrying amount decreases over time) and may become impaired. As is the case with property, plant, and equipment, the assets are not tested annually for impairment. Instead, they are tested only when significant events suggest the need to test. The company assesses at the end of each reporting period whether a significant event suggesting the need to test for impairment has occurred. Examples of such events include a significant decrease in the market price or a significant adverse change in legal or economic factors. Impairment accounting for intangible assets with a finite life is essentially the same as for tangible assets; the amount of the impairment loss will reduce the carrying amount of the asset on the balance sheet and will reduce net income on the income statement.

Impairment of Intangibles with Indefinite Lives

Intangible assets with indefinite lives are not amortized. Instead, they are carried on the balance sheet at historical cost but are tested at least annually for impairment. Impairment exists when the carrying amount exceeds its fair value.

Impairment of Long-Lived Assets Held for Sale

A long-lived (non-current) asset is reclassified as held for sale rather than held for use when management's intent is to sell it and its sale is highly probable. (Additionally, accounting standards require that the asset must be available for immediate sale in its present condition.)⁸ For instance, assume a building is no longer needed by a company and management's intent is to sell it. If the transaction meets the accounting criteria, the building is reclassified from property, plant, and equipment to non-current assets held for sale. At the time of reclassification, assets previously held for use are tested for impairment. If the carrying amount at the time of reclassification exceeds the fair

⁸ IFRS 5, *Non-current Assets Held for Sale and Discontinued Operations*.

value less costs to sell, an impairment loss is recognized and the asset is written down to fair value less costs to sell. Long-lived assets held for sale cease to be depreciated or amortized.

Reversals of Impairments of Long-Lived Assets

After an asset has been deemed impaired and an impairment loss has been reported, the asset's recoverable amount could potentially increase. For instance, a lawsuit appeal may successfully challenge a patent infringement by another company, with the result that a patent previously written down has a higher recoverable amount. IFRS permit impairment losses to be reversed if the recoverable amount of an asset increases regardless of whether the asset is classified as held for use or held for sale. Note that IFRS permit the reversal of impairment losses only. IFRS do not permit the revaluation to the recoverable amount if the recoverable amount exceeds the previous carrying amount. Under US GAAP, the accounting for reversals of impairments depends on whether the asset is classified as held for use or held for sale.⁹ Under US GAAP, once an impairment loss has been recognized for assets held for use, it cannot be reversed. In other words, once the value of an asset held for use has been decreased by an impairment charge, it cannot be increased. For assets held for sale, if the fair value increases after an impairment loss, the loss can be reversed.

Derecognition

A company derecognizes an asset (i.e., removes it from the financial statements) when the asset is disposed of or is expected to provide no future benefits from either use or disposal. A company may dispose of a long-lived operating asset by selling it, exchanging it, abandoning it, or distributing it to existing shareholders. As previously described, non-current assets that management intends to sell or to distribute to existing shareholders and which meet the accounting criteria (immediately available for sale in current condition and the sale is highly probable) are reclassified as non-current assets held for sale.

Sale of Long-Lived Assets

The gain or loss on the sale of long-lived assets is computed as the sales proceeds minus the carrying amount of the asset at the time of sale. An asset's carrying amount is typically the net book value (i.e., the historical cost minus accumulated depreciation), unless the asset's carrying amount has been changed to reflect impairment and/or revaluation, as previously discussed.

EXAMPLE 4

Calculation of Gain or Loss on the Sale of Long-Lived Assets

1. Moussilauke Diners Inc., a fictional company, is revamping its menus to focus on healthier food items. The company sells 450 used pizza ovens for \$3.1 million. At the time of sale, the oven had a carrying amount that reflected an original cost of \$5.1 million and \$3.2 million in accumulated depreciation. What would be the reported gain or loss from selling the ovens?

A. A. \$0.1 million loss

⁹ FASB ASC, Section 360-10-35, *Property, Plant, and Equipment—Overall—Subsequent Measurement*.

- B. B. \$1.2 million gain
- C. C. \$3.1 million gain

Solution to 1:

B is correct. The ovens had a carrying amount of $\$5.1 - \$3.2 = \$1.9$ million, and Moussilauke sold the ovens at a price of \$3.1 million, resulting in a gain on the sale of \$1.2 million. Ignoring taxes, the cash flow from the sale is \$3.1 million, which would be reported as a cash inflow from investing.

A gain or loss on the sale of an asset is disclosed on the income statement, either as a component of other gains and losses or in a separate line item when the amount is material. A company typically discloses further detail about the sale in the management discussion and analysis and/or financial statement footnotes. In addition, a statement of cash flows prepared using the indirect method adjusts net income to remove any gain or loss on the sale from operating cash flow and to include the amount of proceeds from the sale in cash from investing activities. Recall that the indirect method of the statement of cash flows begins with net income and makes all adjustments to arrive at cash from operations, including removal of gains or losses from non-operating activities.

Long-Lived Assets Disposed of Other Than by a Sale

Long-lived assets to be disposed of other than by a sale (e.g., abandoned, exchanged for another asset, or distributed to owners in a spin-off) are classified as held for use until disposal or until they meet the criteria to be classified as held for sale or held for distribution.¹⁰ Thus, the long-lived assets continue to be depreciated and tested for impairment, unless their carrying amount is zero, as required for other long-lived assets owned by the company.

When an asset is retired or abandoned, the accounting is similar to a sale, except that the company does not record cash proceeds. Assets are reduced by the carrying amount of the asset at the time of retirement or abandonment, and a loss equal to the asset's carrying amount is recorded.

When an asset is exchanged, accounting for the exchange typically involves removing the carrying amount of the asset given up, adding a fair value for the asset acquired, and reporting any difference between the carrying amount and the fair value as a gain or loss. The fair value used is the fair value of the asset given up unless the fair value of the asset acquired is more clearly evident. If no reliable measure of fair value exists, the acquired asset is measured at the carrying amount of the asset given up. A gain is reported when the fair value used for the newly acquired asset exceeds the carrying amount of the asset given up. A loss is reported when the fair value used for the newly acquired asset is less than the carrying amount of the asset given up. If the acquired asset is valued at the carrying amount of the asset given up because no reliable measure of fair value exists, no gain or loss is reported.

When a spin-off occurs, typically, an entire cash generating unit of a company with all its assets is spun off. As an illustration of a spin-off, Fiat Chrysler Automobiles (FCA) spun off its ownership of Ferrari in 2016. Prior to the spin-off, FCA had sold 10 percent of its ownership of Ferrari in an IPO and recognized an increase in Shareholders' equity of EUR873 million (the difference between the consideration it received in the IPO of EUR866 million and the carrying amount of the equity interest sold of EUR7 million.) In contrast, the spin-off, in which FCA distributed its ownership in Ferrari to the existing FCA shareholders, did not result in any gain or loss.

FCA's spin-off was completed on 3 January 2016, with each FCA shareholder receiving one common share of Ferrari N.V. for every ten common shares of FCA. In its financial statements for the prior fiscal year, FCA shows the assets and liabilities of Ferrari as held for distribution. Specifically, its balance sheet includes € 3,650 million

in Assets Held for Distribution as a component of current assets and € 3,584 million Liabilities Held for Distribution. Exhibit 2 includes excerpts from the company's 31 December 2015 annual report.

Exhibit 2: Excerpt from Fiat Chrysler Automobiles (FCA) Notes to the Consolidated Financial Statements, 2015 Annual Report

Ferrari Spin-off and Discontinued Operations

“As the spin-off of Ferrari N.V. became highly probable with the aforementioned shareholders' approval and since it was available for immediate distribution at that date, the Ferrari segment met the criteria to be classified as a disposal group held for distribution to owners and a discontinued operation pursuant to IFRS 5 - *Non-current Assets Held for Sale and Discontinued Operations*.”

The following assets and liabilities of the Ferrari segment were classified as held for distribution on 31 December 2015:

	At 31 December 2015
Assets classified as held for distribution	(euro millions)
Goodwill	786
Other intangible assets	297
Property, plant, and equipment	627
Other non-current assets	134
Receivables from financing activities	1,176
Cash and cash equivalents	182
Other current assets	448
Total Assets held for distribution	3,650
Liabilities classified as held for distribution	
Provisions	224
Debt	2,256
Other current liabilities	624
Trade payables	480
Total Liabilities held for distribution	3,584

4

PRESENTATION AND DISCLOSURE



analyze and interpret financial statement disclosures regarding property, plant, and equipment and intangible assets

Under IFRS, for each class of property, plant, and equipment, a company must disclose the measurement basis, the depreciation method, the useful life (or, equivalently, the depreciation rate) used, the gross carrying amount, and the accumulated depreciation at the beginning and end of the period, and a reconciliation of the carrying amount at

the beginning and end of the period.¹⁰ In addition, disclosures of restrictions on title and pledges as security of property, plant, and equipment and contractual agreements to acquire property, plant, and equipment are required. If the revaluation model is used, the date of revaluation, details of how the fair value was obtained, the carrying amount under the cost model, and the revaluation surplus must be disclosed. A company must also disclose the depreciation expense for the period, the balances of major classes of depreciable assets, accumulated depreciation by major classes or in total, and a general description of the depreciation method(s) used in computing depreciation expense with respect to the major classes of depreciable assets.

Under IFRS, for each class of intangible assets, a company must disclose whether the useful lives are indefinite or finite. If finite, for each class of intangible asset, a company must disclose the useful lives (or, equivalently, the amortization rate) used, the amortization methods used, the gross carrying amount and the accumulated amortization at the beginning and end of the period, where amortization is included on the income statement, and a reconciliation of the carrying amount at the beginning and end of the period.¹¹ If an asset has an indefinite life, the company must disclose the carrying amount of the asset and why it is considered to have an indefinite life. Similar to property, plant, and equipment, disclosures of restrictions on title and pledges as security of intangible assets and contractual agreements to acquire intangible assets are required. If the revaluation model is used, the date of revaluation, details of how the fair value was obtained, the carrying amount under the cost model, and the revaluation surplus must be disclosed.

Under US GAAP, companies are required to disclose the gross carrying amounts and accumulated amortization in total and by major class of intangible assets, the aggregate amortization expense for the period, and the estimated amortization expense for the next five fiscal years.¹²

The disclosures related to impairment losses also differ under IFRS and US GAAP. Under IFRS, a company must disclose for each class of assets the amounts of impairment losses and reversals of impairment losses recognized in the period and where those are recognized on the financial statements.¹³ The company must also disclose in aggregate the main classes of assets affected by impairment losses and reversals of impairment losses and the main events and circumstances leading to recognition of these impairment losses and reversals of impairment losses. Under US GAAP, there is no reversal of impairment losses for assets held for use. The company must disclose a description of the impaired asset, what led to the impairment, the method of determining fair value, the amount of the impairment loss, and where the loss is recognized on the financial statements.¹⁴

Disclosures about long-lived assets appear throughout the financial statements: in the balance sheet, the income statement, the statement of cash flows, and the notes. The balance sheet reports the carrying value of the asset. For the income statement, depreciation expense may or may not appear as a separate line item. Under IFRS, whether the income statement discloses depreciation expense separately depends on whether the company is using a ‘nature of expense’ method or a ‘function of expense’ method. Under the nature of expense method, a company aggregates expenses “according to their nature (e.g., depreciation, purchases of materials, transport costs, employee benefits and advertising costs), and does not reallocate them among functions within the entity.”¹⁵ Under the function of expense method, a company classifies expenses

10 IAS 16, *Property, Plant and Equipment*, paragraphs 73–79, *Disclosure*.

11 IAS 38, *Intangible Assets*, paragraphs 118–128, *Disclosure*.

12 FASB ASC, Section 350-30-50, *Intangibles—General—Disclosure*.

13 IAS 36, *Impairment of Assets*, paragraphs 126–137, *Disclosure*.

14 IAS 36, *Impairment of Assets*, paragraphs 126–137, *Disclosure*.

15 IAS 1, paragraph 102.

according to the function, for example as part of cost of sales or of SG&A (selling, general, and administrative) expenses. At a minimum, a company using the function of expense method must disclose cost of sales, but the other line items vary.

The statement of cash flows reflects acquisitions and disposals of fixed assets in the investing section. In addition, when prepared using the indirect method, the statement of cash flows typically shows depreciation expense (or depreciation plus amortization) as a line item in the adjustments of net income to cash flow from operations. The notes to the financial statements describe the company's accounting method(s), the range of estimated useful lives, historical cost by main category of fixed asset, accumulated depreciation, and annual depreciation expense.

The following example provides excerpts relating to intangible assets and property, plant, and equipment from the annual report of Orange SA for the year ended 31 December 2017.

EXAMPLE 5

Financial Statement Presentation and Disclosures for Long-Lived Assets

The following exhibits include excerpts from the annual report for the year ended 31 December 2017 of Orange SA, an international telecommunications company based in France.

Exhibit 3: Orange SA, 2017 Consolidated Financial Statement

Excerpt from Consolidated Income Statement (euro millions)

(Note that only selected line items/data are shown for illustrative purposes)

	12 Months Ended		
	31 Dec. 2017	31 Dec. 2016	31 Dec. 2015
Revenues	€41,096	€40,918	€40,236
...	...	...	...
Depreciation and amortization	(6,846)	(6,728)	(6,465)
...	...	...	...
Impairment of goodwill	(20)	(772)	
Impairment of fixed assets	(190)	(207)	(38)
...	...	...	...
Operating income	4,917	4,077	4,742
...	...	...	...
Consolidated net income of continuing operations	2,114	1,010	2,510
Consolidated net income of discontinued operations (EE)	29	2,253	448
Consolidated net income	2,143	3,263	2,958
Net income attributable to owners of the parent company	1,906	2,935	2,652
Non-controlling interests	€237	€328	€306

Excerpt from the Consolidated Statement of Financial Position (euro millions)

Assets	31 Dec. 2017	31 Dec. 2016	31 Dec. 2015
Goodwill	€27,095	€27,156	€27,071
Other intangible assets	14,339	14,602	14,327
Property, plant, and equipment	26,665	25,912	25,123
...	...	...	...
Total non-current assets	74,035	74,819	71,330
...	...	...	...
Total current assets	20,679	19,849	14,312
Assets held for sale			5,788
Total assets	94,714	94,668	91,430
Equity and liabilities			
...	...	...	...
Total equity	32,942	33,174	33,267
...	...	...	...
Total non-current liabilities	32,736	35,590	36,537
...	...	...	...
Total current liabilities	29,036	25,904	21,626
Total equity and liabilities	94,714	94,668	91,430

Exhibit 4: Orange SA, 2017 Notes to the Consolidated Financial Statement

Excerpt from Note 7.2 Goodwill

Excerpt from Reconciliation of Changes in Goodwill (euro millions)

12 Months Ended			
	31 Dec. 2017	31 Dec. 2016	31 Dec. 2015
Gross value in the opening balance	€32,689	€32,606	€30,271
Acquisitions	38	904	2,333
Disposals	0	(6)	(69)
Translation adjustment	(40)	(815)	73
Reclassifications and other items	0	0	(2)
Reclassification to assets held for sale	0	0	0
Gross value in closing balance	32,687	32,689	32,606
Accumulated impairment losses in the opening balance	(5,533)	(5,535)	(5,487)
Impairment	(20)	(772)	0
Disposals	0	0	0
Translation adjustment	(39)	774	(48)
Reclassifications and other items	0	0	0
Reclassification to assets held for sale	0	0	0

Excerpt from Reconciliation of Changes in Goodwill (euro millions)

	12 Months Ended		
	31 Dec. 2017	31 Dec. 2016	31 Dec. 2015
Accumulated impairment losses in the closing balance	€(5,592)	€(5,533)	€(5,535)
Net book value of goodwill	27,095	27,156	27,071

Excerpt* from Note 7.3 Key assumptions used to determine recoverable amounts as of 31 December 2017*

The parameters used for the determination of recoverable amount of the main consolidated operations are set forth below:

	France	Spain	Poland	Belgium	Romania
Perpetuity growth rate	0.8%	1.5%	1.0%	0.5%	2.3%
Post-tax discount rate	5.5%	8.6%	8.3%	6.8%	8.8%

Excerpt from Note 7.4 Sensitivity of recoverable amounts as of 31 December 2017*

The level of sensitivity presented allows readers of the financial statements to estimate the impact in their own assessment.

(in billions of euros)	France	Spain	Poland	Belgium	Romania
Decrease by 1% in perpetuity growth rate	10.4	1.6	0.6	0.3	0.3
An increase by 1% in post-tax discount rate	11.4	2.0	0.6	0.3	0.3

* Table extracted presents only selected assumptions and selected countries.

The company's annual report provides more detail.

"Goodwill is not amortized. It is tested for impairment at least annually and more frequently when there is an indication that it may be impaired These tests are performed at the level of each Cash Generating Unit (CGU) (or group of CGUs)... To determine whether an impairment loss should be recognized, the carrying value of the assets and liabilities of the CGUs or groups of CGUs is compared to recoverable amount, for which Orange uses mostly the value in use.... Value in use is the present value of the future expected cash flows. Cash flow projections are based on economic and regulatory assumptions, license renewal assumptions and forecast trading and investment activity drawn up by the Group's management..."

Excerpt from Note 8.3 Other intangible assets—Net book value

	31 December		
(in millions of euros)	2017	2016	2015
Telecommunications licenses	6,233	6,440	5,842
Orange brand	3,133	3,133	3,133
Other brands	88	102	137

	31 December		
<i>(in millions of euros)</i>	2017	2016	2015
Customer bases	555	703	729
Software	3,946	3,781	3,815
Other intangible assets	384	443	671
Total	€14,339	€14,602	€14,327

Excerpt from Note 8.4 Property, plant and equipment—Net book value

	31 December		
<i>(in millions of euros)</i>	2017	2016	2015
Land and buildings	2,535	2,661	2,733
Network and terminals	22,880	21,984	21,194
IT equipment	802	784	787
Other property, plant, and equipment	448	483	409
Total	€26,665	€25,912	€25,123

Exhibit 5: Orange SA, 2017 Analysis of the Group's Financial Position and Earnings

“Orange group operating income stood at 4,077 million euros in 2016, compared with 4,742 million euros in 2015 on a historical basis, a drop of 14.0% or 665 million euros. This drop on a historical basis was largely attributable to:

- the recognition, in 2016, of 772 million euros in impairment loss of goodwill ... and 207 million euros in impairment loss of fixed assets ... primarily relating to:
 - Poland for 507 million euros. This impairment loss mainly reflects a decline in competitiveness in the ADSL market, a deterioration in revenue assumptions in the mobile market and an increase in the post-tax discount rate due to the downgrading of the country's sovereign rating by the rating agencies,
 - Egypt for 232 million euros. This impairment loss reflects the financial terms of the 4G license awarded in 2016, the sharp depreciation of the Egyptian pound and increased political and economic uncertainty,
 - in the Congo (DRC), for 109 million euros. This impairment loss reflects political and economic uncertainty, a decline in purchasing power with a knock-on effect on the consumption of telecommunications products and services and an increased regulatory burden (particularly connected with the implementation of customer identification),
 - Cameroon for 90 million euros. This impairment loss reflects a decline in voice revenues following the surge in messaging services and in VoIP of Over-The-Top (OTT) providers and heightened competition in the mobile market,

- and Niger for 26 million euros;
- and the 263 million euro increase in depreciation and amortization.”

1. What proportion of Orange’s total assets as of 31 December 2017 is represented by goodwill and other intangible assets?

Solution:

As of 31 December 2017, goodwill represents 28.6 percent ($= 27,095 \div 94,714$) of Orange’s total assets. Other intangible assets represent 15.1 percent ($= 14,339 \div 94,714$). Data are from the company’s balance sheet in Exhibit 3.

2. What is the largest component of the company’s impairment losses during the year ending December 2016?

Solution:

The largest component of the EUR772 impairment loss on goodwill and the EUR207 million impairment loss of fixed assets related to a EUR507 million loss in Poland. The company attributed the loss to a decline in the competitiveness of the market for its ADSL technology, a reduction in revenue assumptions, and an increase in the discount rate resulting from the downgrading of the country’s debt rating. From Exhibit 4:
[The company’s financial statements define ADSL (Asymmetrical Digital Subscriber Line) as a “broadband data transmission technology on the traditional telephone network. It enables broadband data transmission (first and foremost Internet access) via twisted paired copper cable (the most common type of telephone line found in buildings).”]

3. The company discloses that it determines whether an impairment loss should be recognized by comparing the carrying value of a unit’s assets and liabilities to the “recoverable amount,” equal to the company’s estimate of its value in use. How does the company determine value in use?

Solution:

The company determines value in use – which it uses as a unit’s assets and liabilities “recoverable amount” in impairment testing – as the present value of the future expected cash flows. The cash flow projections are based on management’s assumptions. From Note 7.4 in Exhibit 4.

4. By what amount would the estimated recoverable value of the company’s operations in France, Spain, Poland, Belgium, and Romania change if the company decreased its estimate of the perpetuity growth rate by 1 percent? By what amount would the estimated recoverable value of these operations change if the company increased its estimate of the post-tax discount rate by 1 percent?

Solution:

If the company decreased its estimate of the perpetuity growth rate by 1 percent, the estimated recoverable value of the company’s operations in France, Spain, Poland, Belgium and Romania would be reduced by EUR13.2 billion ($= 10.4 + 1.6 + 0.6 + 0.3 + 0.3$). A decrease in estimated growth decreases the present value of the cash flows. If the company increased its estimate of the post-tax discount rate by 1 percent, the estimated recoverable value of these operations would be reduced by EUR14.6 billion ($= 11.4 +$

2.0 + 0.6 + 0.3 + 0.3). An increase in the discount rate decreases the present value of cash flows. Data are from Note 7.4 in Exhibit 4.

5. What are the largest components of other intangible assets as of 31 December 2017? What is the largest component of property, plant and equipment as of 31 December 2017?

Solution:

The largest components of other intangible assets as of 31 December 2017 are telecommunications licenses, software, and the Orange brand, reported at EUR6,233 million, EUR3,946 million, and EUR3,133 million, respectively. The largest component of property, plant, and equipment as of 31 December 2017 is network and terminals (EUR22,880 million). Data are from Notes 8.3 and 8.4 in Exhibit 4.

Note that the exhibits in the previous example contain relatively brief excerpts from the company's disclosures. The complete text of the disclosures concerning the company's non-current assets spans numerous different footnotes, some of which are several pages long. Overall, an analyst can use the disclosures to understand a company's investments in tangible and intangible assets, how those investments changed during a reporting period, how those changes affected current performance, and what those changes might indicate about future performance.

USING DISCLOSURES IN ANALYSIS

5



analyze and interpret financial statement disclosures regarding property, plant, and equipment and intangible assets

Ratios used in analyzing fixed assets include the fixed asset turnover ratio and several asset age ratios. The fixed asset turnover ratio (total revenue divided by average net fixed assets) reflects the relationship between total revenues and investment in PPE (property, plant, & equipment). The higher this ratio, the higher the amount of sales a company is able to generate with a given amount of investment in fixed assets. A higher asset turnover ratio is often interpreted as an indicator of greater efficiency.

Asset age ratios generally rely on the relationship between historical cost and depreciation. Under the revaluation model (permitted under IFRS but not US GAAP), the relationship between carrying amount, accumulated depreciation, and depreciation expense will differ when the carrying amount differs significantly from the depreciated historical cost. Therefore, the following discussion of asset age ratios applies primarily to PPE reported under the cost model.

Asset age and remaining useful life, two asset age ratios, are important indicators of a company's need to reinvest in productive capacity. The older the assets and the shorter the remaining life, the more a company may need to reinvest to maintain productive capacity. The average age of a company's asset base can be estimated as accumulated depreciation divided by depreciation expense. The average remaining life of a company's asset base can be estimated as net PPE divided by depreciation expense. These estimates simply reflect the following relationships for assets accounted for on a historical cost basis: total historical cost minus accumulated depreciation equals net PPE; and, under straight-line depreciation, total historical cost less salvage value divided by estimated useful life equals annual depreciation expense. Equivalently,

total historical cost less salvage value divided by annual depreciation expense equals estimated useful life. Assuming straight-line depreciation and no salvage value (for simplicity), we have the following:

Estimated total useful life	=	Time elapsed since purchase (Age)	+	Estimated remaining life
Historical cost ÷ annual depreciation expense	=	Estimated total useful life		
Historical cost	=	Accumulated depreciation	+	Net PPE

Equivalently,

Estimated total useful life	=	Estimated age of equipment	+	Estimated remaining life
Historical cost ÷ annual depreciation expense	=	Accumulated depreciation ÷ annual depreciation expense	+	Net PPE ÷ annual depreciation expense

The application of these estimates can be illustrated by a hypothetical example of a company with a single depreciable asset. Assume the asset initially cost USD100, had an estimated useful life of 10 years, and an estimated salvage value of USD0. Each year, the company records a depreciation expense of USD10, so accumulated depreciation will equal USD10 times the number of years since the asset was acquired (when the asset is 7 years old, accumulated depreciation will be USD70). Equivalently, the age of the asset will equal accumulated depreciation divided by the annual depreciation expense.

In practice, such estimates are difficult to make with great precision. Companies use depreciation methods other than the straight-line method and have numerous assets with varying useful lives and salvage values, including some assets that are fully depreciated, so this approach produces an estimate only. Moreover, fixed asset disclosures are often quite general. Consequently, these estimates may be primarily useful to identify areas for further investigation.

One further measure compares a company's current reinvestment in productive capacity. Comparing annual capital expenditures to annual depreciation expense provides an indication of whether productive capacity is being maintained. It is a very general indicator of the rate at which a company is replacing its PPE relative to the rate at which PPE is being depreciated.

EXAMPLE 6

Using Fixed Asset Disclosure to Compare Companies' Fixed Asset Turnover and Average Age of Depreciable Assets

Consider the property, plant, and equipment for the following three international telecommunications companies:

- Orange SA, which we discussed previously, has been listed on Euronext Paris (symbol ORA) and on the New York Stock Exchange (symbol ORAN) since 1997. At 31 December 2017, the French government retained 22.95 percent of the share capital.
- BCE Inc., Canada's largest communications company, provides wireless, wireline, Internet, TV, and business communications across Canada. BCE's shares are publicly traded on the Toronto Stock Exchange and on the New York Stock Exchange (TSX, NYSE: BCE).

- Verizon Communications Inc. is a US-based global provider of communications, information, and entertainment products and services to consumers, businesses, and governmental agencies. Verizon's shares are listed on the New York Stock Exchange and the NASDAQ Global Select Market (symbol VZ).

Exhibit 6: Selected Information from the Companies' Financial Statements

	Orange	BCE Inc	Verizon
Currency, Millions of:	Euro	Canadian dollars	US dollars
Historical cost total PPE, end of year	97,092	69,230	246,498
Accumulated depreciation, end of year	70,427	45,197	157,930
Net PPE, end of year	26,665	24,033	88,568
Net PPE, beginning of year	25,912	22,346	84,751
Revenues	41,096	22,719	126,034
Annual depreciation expense	4,708	3,037	14,741
Capital expenditure	5,677	4,149	17,247
Land included in PPE	Not separated	Not separated	806
Accounting standards	IFRS	IFRS	US GAAP
PPE measurement	Historical cost	Historical cost	Historical cost
Depreciation method	Straight-line	Straight-line	Straight-line

Sources: Companies' 2017 Annual Financial Reports."

1. Based on the data for each company in Exhibit 5, estimate the total useful life, age, and remaining useful life of PPE.

Solution:

The following table presents the estimated total useful life, estimated age, and estimated remaining useful life of PPE for each of the companies.

Estimates	Orange	BCE Inc	Verizon
Estimated total useful life (years)	20.6	22.8	16.7
Estimated age (years)	15.0	14.9	10.7
Estimated remaining life (years)	5.7	7.9	6.0

The computations are demonstrated using Verizon's data (\$ in millions).

The estimated total useful life of PPE is total historical cost of PPE of USD246,498 divided by annual depreciation expense of USD14,741, giving 16.7 years. Estimated age and estimated remaining life are obtained by dividing accumulated depreciation of USD157,930 and net PPE of USD88,568 by the annual depreciation expense of USD14,741, giving 10.7 years and 6.0 years, respectively.

Ideally, the estimates of asset lives illustrated in this example should exclude land, which is not depreciable, when the information is available; however,

both Orange and BCE report Land and Buildings as a combined amount. We will use Verizon, for which land appeared to be disclosed separately in the above table, to illustrate the estimates with adjusting for land. As an illustration of the calculations to exclude land, excluding Verizon's land would give an estimated total useful life for the non-land PPE of 16.7 years [(total cost EUR246,498 minus land cost of USD806) divided by annual depreciation expense of EUR14,741 million]. The estimate is essentially unchanged from the estimate including land because land represents such a small component of Verizon's PPE.

2. 2. Interpret the estimates of estimated total useful life, age, and remaining life. What items might affect comparisons across the three companies?

Solution:

The estimated total useful life suggests that Orange and BCE depreciate PPE over a much longer period than Verizon: 20.6 and 22.8 years for Orange and BCE, respectively, versus 16.7 years for Verizon.

The estimated age of the equipment suggests that Verizon has the newest PPE with an estimated age of 10.7 years. Additionally, the estimates suggest that around 73 percent of Orange's assets' useful lives have passed ($15.0 \text{ years} \div 20.6 \text{ years}$, or equivalently, $\text{EUR}70,427 \text{ million} \div \text{EUR}97,092 \text{ million}$). In comparison, around 65 and 64 percent of the useful lives of the PPE of BCE and Verizon, respectively, have passed.

Items that can affect comparisons across the companies include business differences, such as differences in composition of the companies' operations and differences in acquisition and divestiture activity. This result can be compared, to an extent, to the useful lives and asset mix disclosed in the companies' footnotes; however, differences in disclosures (e.g., in the categories of assets disclosed) can affect comparisons.

3. 3. How does each company's 2017 depreciation expense compare to its capital expenditures for the year?

Solution:

All three companies' capital expenditure exceeds its depreciation expense. Rounding to the nearest 10 percent, capital expenditure as a percentage of depreciation is 120 percent for Orange, 140 percent for BCE, and 120 percent for Verizon. All three companies are replacing PPE at a faster rate than the PPE is being depreciated, consistent with the companies' somewhat older asset base.

4. 4. Calculate and compare fixed asset turnover for each company.

Solution:

Fixed asset turnover is calculated as total revenues divided by average net PPE. Orange's fixed asset turnover is 1.6 ($= 41,096 / ((26,665 + 25,912) / 2)$). BCE's fixed asset turnover is 1.0, and Verizon's fixed asset turnover is 1.5. Orange's and Verizon's higher levels of fixed asset turnover indicate these companies, compared to BCE, are able to generate more sales per unit of investment in fixed assets.

PRACTICE PROBLEMS

The following information relates to questions 1-3

An analyst is studying the impairment of the manufacturing equipment of WLP Corp., a UK-based corporation that reports under IFRS. He gathers the following information about the equipment:

Fair value	GBP16,800,000
Costs to sell	GBP800,000
Value in use	GBP14,500,000
Net carrying amount	GBP19,100,000

- Based on this information, the amount of impairment loss that WLP will need to report on its income statement related to the manufacturing equipment is *closest* to:
 - GBP2,300,000.
 - GBP3,100,000.
 - GBP4,600,000.
- Under IFRS, an impairment loss on a property, plant, and equipment asset is measured as the excess of the carrying amount over the asset's:
 - fair value.
 - recoverable amount.
 - undiscounted expected future cash flows.
- The impairment of intangible assets with finite lives affects:
 - only the balance sheet.
 - only the income statement.
 - both the balance sheet and the income statement.

The following information relates to questions 4-7

Melanie Hart, CFA, is a transportation analyst. Hart has been asked to write a research report on Altai Mountain Rail Company (AMRC). Like other companies in the railroad industry, AMRC's operations are capital intensive, with significant investments in long-lived tangible assets as property, plant, and equipment. In November of 2021, AMRC's board of directors hired a new team to manage the

company. In reviewing the company's 2022 annual report, Hart is concerned about some of the accounting choices that the new management has made. These choices differ from those of the previous management and from common industry practice. Hart has highlighted the following statements from the company's annual report:

Statement 1 "In 2022, AMRC spent significant amounts on track replacement and similar improvements. AMRC expensed rather than capitalized a significant proportion of these expenditures."

Statement 2 "AMRC uses the straight-line method of depreciation for both financial and tax reporting purposes to account for plant and equipment."

Statement 3 "In 2022, AMRC recognized an impairment loss of €50 million on a fleet of locomotives. The impairment loss was reported as 'other income' in the income statement and reduced the carrying amount of the assets on the balance sheet."

Exhibit 1 and Exhibit 2 contain AMRC's 2022 consolidated income statement and balance sheet. AMRC prepares its financial statements in accordance with International Financial Reporting Standards.

Exhibit 1: Consolidated Statement of Income

For the Years Ended 31 December	2022		2021	
	Euros millions	Revenues (%)	Euros millions	Revenues (%)
Operating revenues	2,600	100.0	2,300	100.0
Operating expenses				
Depreciation	(200)	(7.7)	(190)	(8.3)
Other operating expense	(1,590)	(61.1)	(1,515)	(65.9)
Total operating expenses	(1,790)	(68.8)	(1,705)	(74.2)
Operating income	810	31.2	595	25.8
Other income	(50)	(1.9)		0.0
Interest expense	(73)	(2.8)	(69)	(3.0)
Income before taxes	687	26.5	526	22.8
Income taxes	(272)	(10.5)	(198)	(8.6)
Net income	415	16	328	14.2

Exhibit 2: Consolidated Balance Sheet

As of 31 December	2022		2021	
	Euros millions	Assets (%)	Euros millions	Assets (%)
Assets				
Current assets	500	9.4	450	8.5
Property & equipment:				
Land	700	13.1	700	13.2
Plant & equipment	6,000	112.1	5,800	109.4

Total property & equipment	6,700	125.2	6,500	122.6
Accumulated depreciation	(1,850)	(34.6)	(1,650)	(31.1)
Net property & equipment	4,850	90.6	4,850	91.5
Total assets	5,350	100.0	5,300	100.0
Liabilities and Shareholders' Equity				
Current liabilities	480	9.0	430	8.1
Long-term debt	1,030	19.3	1,080	20.4
Other long-term provisions and liabilities	1,240	23.1	1,440	27.2
Total liabilities	2,750	51.4	2,950	55.7
Shareholders' equity				
Common stock and paid-in-surplus	760	14.2	760	14.3
Retained earnings	1,888	35.5	1,600	30.2
Other comprehensive losses	(48)	(0.9)	(10)	(0.2)
Total shareholders' equity	2,600	48.6	2,350	44.3
Total liabilities & shareholders' equity	5,350	100.0	5,300	100.0

4. With respect to Statement 1, which of the following is the *most likely* effect of management's decision to expense rather than capitalize these expenditures?
 - A. 2022 net profit margin is higher than if the expenditures had been capitalized.
 - B. 2022 total asset turnover is lower than if the expenditures had been capitalized.
 - C. Future profit growth will be higher than if the expenditures had been capitalized.
5. With respect to Statement 2, what would be the *most likely* effect in 2023 if AMRC were to switch to an accelerated depreciation method for both financial and tax reporting?
 - A. Net profit margin would increase.
 - B. Total asset turnover would decrease.
 - C. Cash flow from operating activities would increase.
6. With respect to Statement 3, what is the *most likely* effect of the impairment loss?
 - A. Net income in years prior to 2022 was likely understated.
 - B. Net profit margins in years after 2022 will likely exceed the 2022 net profit margin.
 - C. Cash flow from operating activities in 2022 was likely lower due to the impairment loss.
7. Based on Exhibit 1, the *best estimate* of the average remaining useful life of the

company's plant and equipment at the end of 2022 is:

- A. 20.75 years.
 - B. 24.25 years.
 - C. 30.00 years.
-

The following information relates to questions 8-13

Brian Jordan is interviewing for a junior equity analyst position at Orion Investment Advisors. As part of the interview process, Mary Benn, Orion's Director of Research, provides Jordan with information about two hypothetical companies, Alpha and Beta, and asks him to comment on the companies' financial statements and ratios. Both companies prepare their financial statements in accordance with International Financial Reporting Standards (IFRS) and are identical in all respects except for their accounting choices.

Jordan is told that, at the beginning of the current fiscal year, both companies purchased a major new computer system and began building new manufacturing plants for their own use. Alpha capitalized and Beta expensed the cost of the computer system; Alpha capitalized and Beta expensed the interest costs associated with the construction of the manufacturing plants.

Benn asks Jordan, "What was the impact of these decisions on each company's current fiscal year financial statements and ratios?"

Jordan responds, "Alpha's decision to capitalize the cost of its new computer system instead of expensing it results in lower net income, lower total assets, and higher cash flow from operating activities in the current fiscal year. Alpha's decision to capitalize its interest costs instead of expensing them results in a lower fixed asset turnover ratio and a higher interest coverage ratio."

Jordan is told that Alpha uses the straight-line depreciation method and Beta uses an accelerated depreciation method; both companies estimate the same useful lives for long-lived assets. Many companies in their industry use the units-of-production method.

Benn asks Jordan, "What are the financial statement implications of each depreciation method, and how do you determine a company's need to reinvest in its productive capacity?"

Jordan replies, "All other things being equal, the straight-line depreciation method results in the least variability of net profit margin over time, while an accelerated depreciation method results in a declining trend in net profit margin over time. The units-of-production can result in a net profit margin trend that is quite variable. I use a three-step approach to estimate a company's need to reinvest in its productive capacity. First, I estimate the average age of the assets by dividing net property, plant, and equipment by annual depreciation expense. Second, I estimate the average remaining useful life of the assets by dividing accumulated depreciation by depreciation expense. Third, I add the estimates of the average remaining useful life and the average age of the assets in order to determine the total useful life."

Jordan is told that at the end of the current fiscal year, Alpha revalued a manufacturing plant; this increased its reported carrying amount by 15 percent. There was no previous downward revaluation of the plant. Beta recorded an impairment loss on a manufacturing plant; this reduced its carrying value by 10 percent.

Benn asks Jordan “What was the impact of these decisions on each company’s current fiscal year financial ratios?”

Jordan responds, “Beta’s impairment loss increases its debt to total assets and fixed asset turnover ratios, and lowers its cash flow from operating activities. Alpha’s revaluation increases its debt to capital and return on assets ratios, and reduces its return on equity.”

8. Jordan’s response about the financial statement impact of Alpha’s decision to capitalize the cost of its new computer system is correct with respect to:
 - A. lower net income.
 - B. lower total assets.
 - C. higher cash flow from operating activities.
 9. Jordan’s response about the ratio impact of Alpha’s decision to capitalize interest costs is most likely *correct* with respect to the:
 - A. interest coverage ratio.
 - B. fixed asset turnover ratio.
 - C. interest coverage and fixed asset turnover ratios.
 10. Jordan’s response about the impact of the different depreciation methods on net profit margin is most likely *incorrect* with respect to:
 - A. accelerated depreciation.
 - B. straight-line depreciation.
 - C. units-of-production depreciation.
 11. Jordan’s response about his approach to estimating a company’s need to reinvest in its productive capacity is most likely *correct* regarding estimating the:
 - A. average age of the asset base.
 - B. total useful life of the asset base.
 - C. average remaining useful life of the asset base.
 12. Jordan’s response about the effect of Beta’s impairment loss is *incorrect* with respect to the impact on its:
 - A. debt to total assets.
 - B. fixed asset turnover.
 - C. cash flow from operating activities.
 13. Jordan’s response about the effect of Alpha’s revaluation is most likely *correct* with respect to the impact on its:
 - A. return on equity.
 - B. return on assets.
 - C. debt to capital ratio.
-

The following information relates to questions 14-19

A financial analyst at BETTO S.A. is analyzing the result of the sale of a vehicle for 85,000 Argentine pesos (ARP) on 31 December 2021. The analyst compiles the following information about the vehicle:

Acquisition cost of the vehicle	ARP100,000
Acquisition date	1 January 2019
Estimated residual value at acquisition date	ARP10,000
Expected useful life	9 years
Depreciation method	Straight-line

14. The result of the sale of the vehicle is *most likely*:
- A. a loss of ARP 15,000.
 - B. a gain of ARP 15,000.
 - C. a gain of ARP 18,333.
15. CROCO S.p.A sells an intangible asset with a historical acquisition cost of EUR12 million and an accumulated amortization of EUR2 million and reports a loss on the sale of EUR3.2 million. Which of the following amounts is *most likely* the sale price of the asset?
- A. EUR6.8 million
 - B. EUR8.8 million
 - C. EUR13.2 million
16. The gain or loss on a sale of a long-lived asset to which the revaluation model has been applied is *most likely* calculated using sales proceeds less:
- A. carrying amount.
 - B. carrying amount adjusted for impairment.
 - C. historical cost net of accumulated depreciation.
17. According to IFRS, all of the following pieces of information about property, plant, and equipment must be disclosed in a company's financial statements and footnotes *except for*:
- A. useful lives.
 - B. acquisition dates.
 - C. amount of disposals.
18. According to IFRS, all of the following pieces of information about intangible assets must be disclosed in a company's financial statements and footnotes *except for*:
- A. fair value.

- B. impairment loss.
 - C. amortization rate.
19. Which of the following is a required financial statement disclosure for long-lived intangible assets under US GAAP?
- A. The useful lives of assets
 - B. The reversal of impairment losses
 - C. Estimated amortization expense for the next five fiscal years
-

The following information relates to questions 20-23

After reading the financial statements and footnotes of a company that reports under IFRS, an analyst identified the following three intangible assets:

- product patent expiring in 40 years;
 - copyright with no expiration date; and
 - goodwill acquired 2 years ago in a business combination.
20. Which of the three assets is an intangible asset with a finite useful life?
- A. Patent
 - B. Goodwill
 - C. Copyright
21. Intangible assets with finite useful lives *mostly* differ from intangible assets with infinite useful lives with respect to accounting treatment of:
- A. revaluation.
 - B. impairment.
 - C. amortization.
22. Costs incurred for intangible assets are generally expensed when they are:
- A. internally developed.
 - B. individually acquired.
 - C. acquired in a business combination.
23. Under US GAAP, when assets are acquired in a business combination, goodwill *most likely* arises from:
- A. contractual or legal rights.
 - B. assets that can be separated from the acquired company.

- C. assets that are neither tangible nor identifiable intangible assets.
-

SOLUTIONS

1. B is correct. The impairment loss equals GBP3,100,000, calculated as:

$$\text{Impairment} = \max(\text{Fair value less costs to sell; Value in use}) - \text{Net carrying amount}$$

$$= \max(16,800,000 - 800,000; 14,500,000) - 19,100,000$$

$$= -3,100,000.$$
2. B is correct. Under IFRS, an impairment loss is measured as the excess of the carrying amount over the asset's recoverable amount. The recoverable amount is the higher of the asset's fair value less costs to sell and its value in use. Value in use is a discounted measure of expected future cash flows. Under US GAAP, assessing recoverability is separate from measuring the impairment loss. If the asset's carrying amount exceeds its undiscounted expected future cash flows, the asset's carrying amount is considered unrecoverable and the impairment loss is measured as the excess of the carrying amount over the asset's fair value.
3. C is correct. The carrying amount of the asset on the balance sheet is reduced by the amount of the impairment loss, and the impairment loss is reported on the income statement.
4. C is correct. Expensing, rather than capitalizing, an investment in long-term assets will result in higher expenses and lower net income and net profit margin in the current year. Future years' incomes will not include depreciation expense related to these expenditures. Consequently, year-to-year growth in profitability will be higher. If the expenses had been capitalized, the carrying amount of the assets would have been higher and the 2022 total asset turnover would have been lower.
5. C is correct. Switching to an accelerated depreciation method would increase depreciation expense and decrease income before taxes, taxes payable, and net income. Cash flow from operating activities would increase because of the resulting tax savings.
6. B is correct. 2022 net income and net profit margin are lower because of the impairment loss. Consequently, net profit margins in subsequent years are likely to be higher. An impairment loss suggests that insufficient depreciation expense was recognized in prior years, and net income was overstated in prior years. The impairment loss is a non-cash item and will not affect operating cash flows.
7. A is correct. The estimated average remaining useful life is 20.75 years, calculated as:

$$\text{Estimate of remaining useful life} = \text{Net plant and equipment} \div \text{Annual depreciation expense}$$

$$\text{Net plant and equipment} = \text{Plant \& equipment} - \text{Accumulated depreciation}$$

$$= \text{EUR}6,000 - \text{EUR}1,850 = \text{EUR}4,150$$

$$\text{Estimate of remaining useful life} = \text{Net P \& E} \div \text{Depreciation expense}$$

$$= \text{EUR}4,150 \div \text{EUR}200 = 20.75$$
8. C is correct. The decision to capitalize the costs of the new computer system results in higher cash flow from operating activities; the expenditure is reported as an outflow of investing activities. The company allocates the capitalized amount over the asset's useful life as depreciation or amortization expense rather than expensing it in the year of expenditure. Net income and total assets are higher in

the current fiscal year.

9. B is correct. Alpha's fixed asset turnover will be lower because the capitalized interest will appear on the balance sheet as part of the asset being constructed. Therefore, fixed assets will be higher and the fixed asset turnover ratio (total revenue/average net fixed assets) will be lower than if it had expensed these costs. Capitalized interest appears on the balance sheet as part of the asset being constructed instead of being reported as interest expense in the period incurred. However, the interest coverage ratio should be based on interest payments, not interest expense (earnings before interest and taxes/interest payments) and should be unchanged. To provide a true picture of a company's interest coverage, the entire amount of interest expenditure, both the capitalized portion and the expensed portion, should be used in calculating interest coverage ratios.
10. A is correct. Accelerated depreciation will result in an improving, not declining, net profit margin over time, because the amount of depreciation expense declines each year. Under straight-line depreciation, the amount of depreciation expense will remain the same each year. Under the units-of-production method, the amount of depreciation expense reported each year varies with the number of units produced.
11. B is correct. The estimated average total useful life of a company's assets is calculated by adding the estimates of the average remaining useful life and the average age of the assets. The average age of the assets is estimated by dividing accumulated depreciation by depreciation expense. The average remaining useful life of the asset base is estimated by dividing net property, plant, and equipment by annual depreciation expense.
12. C is correct. The impairment loss is a non-cash charge and will not affect cash flow from operating activities. The debt to total assets and fixed asset turnover ratios will increase, because the impairment loss will reduce the carrying amount of fixed assets and therefore total assets.
13. A is correct. In an asset revaluation, the carrying amount of the assets increases. The increase in the asset's carrying amount bypasses the income statement and is reported as other comprehensive income and appears in equity under the heading of revaluation surplus. Therefore, shareholders' equity will increase but net income will not be affected, so return on equity will decline. Return on assets and debt to capital ratios will also decrease.
14. B is correct. The result on the sale of the vehicle is a gain of 15,000, calculated as:

$$\begin{aligned} \text{Gain or loss on the sale} &= \text{Sale proceeds} - \text{Carrying amount} \\ &= \text{Sale proceeds} - (\text{Acquisition cost} - \text{Accumulated depreciation}) \\ &= 85,000 - \{100,000 - [(100,000 - 10,000)/9 \text{ years}] \times 3 \text{ years}\} \\ &= 15,000. \end{aligned}$$
15. A is correct. Gain or loss on the sale = Sale proceeds – Carrying amount. Rearranging this equation, Sale proceeds = Carrying amount + Gain or loss on sale. Thus, Sale price = (12 million – 2 million) + (–3.2 million) = 6.8 million.
16. A is correct. The gain or loss on the sale of long-lived assets is computed as the sales proceeds minus the carrying amount of the asset at the time of sale. This is true under the cost and revaluation models of reporting long-lived assets. In the absence of impairment losses, under the cost model, the carrying amount will equal historical cost net of accumulated depreciation.
17. B is correct. IFRS do not require acquisition dates to be disclosed.

18. A is correct. IFRS do not require fair value of intangible assets to be disclosed.
19. C is correct. Under US GAAP, companies are required to disclose the estimated amortization expense for the next five fiscal years. Under US GAAP, there is no reversal of impairment losses. Disclosure of the useful lives—finite or indefinite and additional related details—is required under IFRS.
20. A is correct. A product patent with a defined expiration date is an intangible asset with a finite useful life. A copyright with no expiration date is an intangible asset with an indefinite useful life. Goodwill is no longer considered an intangible asset under IFRS and is considered to have an indefinite useful life.
21. C is correct. An intangible asset with a finite useful life is amortized, whereas an intangible asset with an indefinite useful life is not amortized. Rather, they are carried on the balance sheet at historical cost and are tested at least annually for impairment.
22. A is correct. The costs to internally develop intangible assets are generally expensed when incurred.
23. C is correct. Under both IFRS and US GAAP, if an item is acquired in a business combination and cannot be recognized as a tangible asset or identifiable intangible asset, it is recognized as goodwill. Under US GAAP, assets arising from contractual or legal rights and assets that can be separated from the acquired company are recognized separately from goodwill.

LEARNING MODULE

8

Topics in Long-Term Liabilities and Equity

by Elizabeth A. Gordon, PhD, MBA, and Elaine Henrik, PhD, CFA.

Elizabeth A. Gordon, PhD, MBA, CPA, is at Temple University (USA), and Elaine Henrik, PhD, CFA, is at Stevens Institute of Technology (USA).

LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
☐	explain the financial reporting of leases from the perspectives of lessors and lessees
☐	explain the financial reporting of defined contribution, defined benefit, and stock-based compensation plans
☐	describe the financial statement presentation of and disclosures relating to long-term liabilities and share-based compensation

INTRODUCTION

1

Non-current liabilities arise from different sources of financing and different types of creditors. While the financial reporting of bonds and loans is straightforward and is covered in the prerequisite materials, the reporting of leases and postemployment liabilities is more complex. Leases are an alternative to asset ownership and have become a common means of financing real estate and capital equipment. Postretirement and stock-based compensation are a large and growing share of employee compensation and operating expenses. Given their importance, this learning module introduces the reporting of leases, pension plans, and stock-based compensation under International Financial Reporting Standards (IFRS) and US GAAP. It concludes by reviewing the presentation and disclosure requirements for these items.

LEARNING MODULE OVERVIEW



- Leasing has several advantages over purchasing an asset outright: less upfront cash commitment, typically low financing costs, and lower risks associated with ownership, such as obsolescence.
- Under IFRS and US GAAP, leases are classified as operating or finance leases. Finance leases resemble an asset purchase or sale while operating leases resemble a rental agreement.

The two major accounting standard setters are as follows: 1) the International Accounting Standards Board (IASB) who establishes International Financial Reporting Standards (IFRS) and 2) the Financial Accounting Standards Board (FASB) who establishes US GAAP. Throughout this learning module both standards are referred to and many, but not all, of these two sets of accounting rules are identified. Note: changes in accounting standards as well as new rulings and/or pronouncements issued after the publication of this learning module may cause some of the information to become dated.

- The financial reporting of a lease depends on whether the party is the lessee or lessor, whether the party reports with IFRS or US GAAP, and the classification of the lease as finance or operating.
- US GAAP and IFRS share the same accounting treatment for lessors but differ slightly for lessees. IFRS has a single accounting model for both operating leases and finance lease lessees, while US GAAP has an accounting model for each.
- Two types of pension plans are defined contribution plans and defined benefits plans. In a defined contribution plan, the amount of employer contribution into the plan is specified (i.e., defined) and the amount of pension that is ultimately paid by the plan (received by the retiree) depends on the performance of the plan's assets. In a defined benefit plan, the amount of pension that is ultimately paid by the plan (received by the retiree) is defined, usually according to a benefit formula.
- In a defined contribution plan, employees bear investment risks (i.e., the potential for investment returns on plan assets to differ from expectations) and actuarial risks (i.e. the potential for retirement and death timing to differ from expectations). In a defined benefit plan, employers bear both investment and actuarial risks.
- Under a defined contribution pension plan, the cash payment made into the plan is recognized as pension expense.
- For defined benefit pension plans, companies must report the difference between the defined benefit pension obligation and the fair value of pension assets as an asset or liability on the balance sheet. An underfunded defined benefit pension plan is shown as a non-current liability. The change in the net asset or liability between balance sheet dates is recognized as a cost of the period, with service cost and net interest expense or income recognized in profit and loss and remeasurement changes recognized in other comprehensive income. There are modest differences in accounting treatment under US GAAP.
- Employee compensation packages are structured to fulfill various objectives, including satisfying employees' needs for liquidity, retaining employees, and providing incentives to employees.
- Share-based compensation serves to align employees' interests with those of the shareholders. It typically includes stock grants and stock options, which have the advantage of requiring no current-period cash outlays. Stock-based compensation is measured using fair value at the grant date and recognized as compensation expense over the vesting period.
- The valuation technique, or option pricing model, that a company uses is an important choice in determining fair value of options used in a compensation agreement and is disclosed in the notes to financial statements. Key inputs into option pricing models include such items as exercise price, stock price volatility, estimated life of each award, estimated number of options that will be forfeited, dividend yield, and the risk-free rate of interest.

LEASES

2

- ☐ explain the financial reporting of leases from the perspectives of lessors and lessees

Firms typically acquire the rights to use assets by outright purchase. As an alternative, a lease is a contract that conveys the right to use an asset for a period of time in exchange for consideration. The party who uses the asset and pays the consideration is the **lessee**, and the party who owns the asset, grants the right to use the asset, and receives consideration is the **lessor**.

Leasing is a way to obtain the benefits of the asset without purchasing it outright. From the perspective of a lessee, it is a form of financing that resembles acquiring an asset with a note payable. From the perspective of a lessor, a lease is a form of investment and can also be an effective selling strategy, because customers generally prefer to pay in installments.

After reviewing the contractual requirements for a lease, this lesson examines the advantages and classification of leases and their financial reporting.

Requirements for Lease Accounting

For a contract to be a lease or contain a lease, it must

- identify a specific underlying asset;
- give the customer the right to obtain largely all of the economic benefits from the asset over the contract term; and
- give the customer, not the supplier, the ability to direct how and for what objective the underlying asset is used.

For example, a contract between a customer and a trucking company is a lease if the contract identifies a specific truck, allows the customer exclusive use of it during the contract term, and lets the customer direct its use. If, however, the customer contracts with a trucking company to ship goods for a fee, the contract would not be a lease, because a specific truck is not identified nor does the customer obtain largely all of the economic benefits from the truck over the contract term.

Examples of Leases

Leasing is among the most prevalent forms of financing. Most companies are lessees of real estate and information technology assets. In 2014, the International Accounting Standards Board found that more than 14,000 publicly listed companies were lessees and that they owed more than USD3.3 trillion in future lease payments in aggregate.¹ Exhibit 1 illustrates several examples of these arrangements.

¹ IFRS, "IASB Shines Light on Leases by Bringing Them onto the Balance Sheet," 13 January 2016, www.ifrs.org/news-and-events/2016/01/iasb-shines-light-on-leases-by-bringing-them-onto-the-balance-sheet.

Exhibit 1: Examples of Leases

Lessee	Lease Disclosure Excerpt
Alibaba	"The Company entered into operating lease agreements primarily for shops and malls, offices, warehouses, and land."
Copa Airlines	"The Company leases some aircraft under long-term lease agreements with an average duration of 10 years. Other leased assets include real estate, airport and terminal facilities, sales offices, maintenance facilities, and general offices."
Meta (formerly Facebook)	"We have entered into various non-cancelable operating lease agreements for certain of our offices, data center, land, colocations, and equipment."
Standard Bank	"The group leases various offices, branch space, and ATM space."

Sources: Companies' 2020 and 2019 annual reports.

Lessors are often real estate investment companies or banks, although there are independent specialist leasing companies, such as AerCap Holdings N.V., which describes itself as "the global leader in aircraft leasing." As of 30 June 2022, the company owned 1,557 passenger aircraft that are leased to airlines.²

Advantages of Leasing

There are several advantages to leasing an asset compared with purchasing it:

- Less cash is needed up front. Leases typically require little, if any, down payment.
- Cost effectiveness: Leases are a form of secured borrowing; in the event of non-payment, the lessor simply repossesses the leased asset. As a result, the effective interest rate for a lease is typically lower than what the lessee would pay on an unsecured loan or bond.
- Convenience and lower risks associated with asset ownership, such as obsolescence.³

From the perspective of a lessor, leasing has advantages over selling outright, which include earning interest income over the lease term and increasing the addressable market for its product by offering customers the ability to use or control an asset while paying smaller amounts over time.

Lease Classification as Finance or Operating

Leases can resemble either the purchase of an asset or a rental contract. For example, a ten-year lease of an automobile with a ten-year useful life for monthly payments that, in aggregate, are equal to or greater than the fair value of the automobile is effectively a debt-financed purchase of that automobile. In contrast, a one-year lease of a machine with a twenty-year useful life resembles a rental contract. A lease that resembles a purchase is classified as a **finance lease**. All other leases are **operating leases**.

² AerCap Holdings N.V. annual report for the fiscal year ended 31 December 31 2019 on Form 20-F.

³ Lessors are aware of asset obsolescence, however, and impound its costs and risks in lease payments.

More specifically, a lease is a finance lease if *any* of the following five criteria are met. These criteria are the same for IFRS and US GAAP. If *none* of the criteria are met, the lease is an operating lease. The same criteria are used by lessees and lessors in classifying a lease.

1. The lease transfers ownership of the underlying asset to the lessee.
2. The lessee has an option to purchase the underlying asset and is reasonably certain it will do so.
3. The lease term is for a major part of the asset's useful life.
4. The present value of the sum of the lease payments equals or exceeds substantially all of the fair value of the asset.
5. The underlying asset has no alternative use to the lessor.

EXAMPLE 1

Lease Identification and Classification

Company C enters a contract with Company D that requires Company C to pay JPY100 million at the end of each of the next two years to Company D for exclusive use of a specific machine over that time period. The present value of the payments is JPY186 million. At the end of the contract, Company C will return the machine to Company D. The contract does not contain a purchase option. The machine can be used in many applications by many types of customers. The remaining useful life of the machine is four years, and its fair value is JPY190 million.

1. This contract is:

- A. not a lease.
- B. an operating lease.
- C. a finance lease.

Solution:

C is correct. This contract is a lease because a specific asset is identified, Company C will exclusively use it, and Company C *will* have the ability to direct its use. The contract is a finance lease because one of the five criteria is met: The present value of the lease payments equals substantially all of the fair value ($186/190 = 98\%$).

2. If the fair value of the machine in question 1 was JPY300 million, would the classification of the contract change?

- A. No
- B. Yes, from an operating lease to a finance lease
- C. Yes, from a finance lease to an operating lease

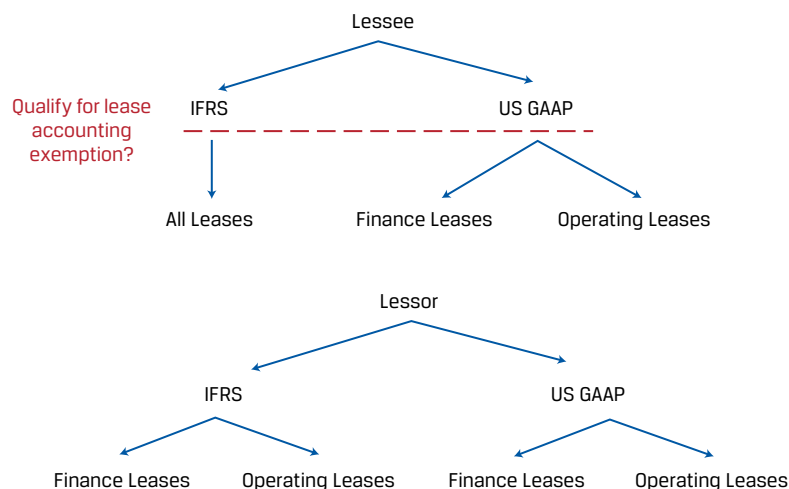
Solution:

C is correct. This change would result in the lease not meeting any of the five criteria for a finance lease. If a lease does not meet any of the five criteria, it is an operating lease.

Financial Reporting of Leases

The financial reporting of a lease depends on whether the party is the lessee or lessor, whether the party reports with IFRS or US GAAP, and the classification of the lease as finance or operating. Additionally, for lessees, there are lease accounting exemptions for certain lease contracts: If its term is 12 months or less (IFRS and US GAAP) or it is for a “low-value asset,” up to USD5,000 in sales price (IFRS only), then the lessee can elect to simply expense the lease payments on a straight-line basis. These exemptions are not available to lessors. Exhibit 2 illustrates the different permutations for lease accounting.

Exhibit 2: Lease Classifications for Lessee and Lessor



Fortunately, lessor accounting under both IFRS and US GAAP is substantially identical, and the differences in treatment for lessees are modest.

Lessee Accounting—IFRS

Under IFRS, there is a single accounting model for both finance and operating leases for lessees. At lease inception, the lessee records a lease payable liability and a right-of-use (ROU) asset on its balance sheet, both equal to the present value of future lease payments. The discount rate used in the present value calculation is either the rate implicit in the lease or an estimated secured borrowing rate.

The lease liability is subsequently reduced by each lease payment using the effective interest method. Each lease payment is composed of interest expense, which is the product of the lease liability and the discount rate, and principal repayment, which is the difference between the interest expense and lease payment.

The ROU asset is subsequently amortized, often on a straight-line basis, over the lease term. So, although the lease liability and ROU asset begin with the same carrying value on the balance sheet, they typically diverge in subsequent periods because the principal repayment that reduces the lease liability and the amortization expense that reduces the ROU asset are calculated differently.

The following list shows how the transaction affects the financial statements:

- The lease liability net of principal repayments and the ROU asset net of accumulated amortization are reported on the balance sheet.

- Interest expense on the lease liability and the amortization expense related to the ROU asset are reported separately on the income statement.
- The principal repayment component of the lease payment is reported as a cash outflow under financing activities on the statement of cash flows, and depending on the lessee's reporting policies, interest expense is reported under either operating or financing activities on the statement of cash flows.

EXAMPLE 2**Lease Impact on Balance Sheet and Income Statement**

Proton Enterprises, a hypothetical manufacturer based in Germany, is offered the following terms to lease a machine: five-year lease with an implied interest rate of 10 percent and an annual lease payment of EUR100,000 per year payable at the end of each year. The present value of the machinery is therefore EUR379,079 (in Microsoft Excel, the formula is =PV(10%,5,-100,000)). The asset will be amortized over the five-year lease term on a straight-line basis. Proton reports under IFRS.

1. What would be the impact of this lease on Proton's balance sheet at the beginning of the year?

Solution:

Proton would report a EUR379,079 lease liability and ROU asset.

2. What would be the impact of this lease on Proton's income statement during the following year?

Solution:

Interest expense and amortization expense are reported on the income statement. In Year 2, interest expense is EUR31,699 and amortization expense is EUR 75,816, as illustrated in the following tables:

	Lease Payment	Interest Expense (10% × Lease Liability)	Principal Repayment (Payment – Interest)	Lease Liability
	FO.1	FO.2	FO.3	FO.4
Year 0				379,079
Year 1	100,000	37,908	62,092	316,987
Year 2	100,000	31,699	68,301	248,685
Year 3	100,000	24,869	75,131	173,554
Year 4	100,000	17,355	82,645	90,909
Year 5	100,000	9,091	90,909	0
Total	500,000	120,921	379,079	

	Amortization Expense	ROU Asset
	Straight-Line F.1	F.2
Year 0		379,079
Year 1	75,816	303,263
Year 2	75,816	227,447
Year 3	75,816	151,631

	Amortization Expense	ROU Asset
Year 4	75,816	75,816
Year 5	75,816	0
Total	379,079	

Note: Totals may not sum due to rounding.

3. What would be the impact of this lease on Proton's statement of cash flows during the following year?

Solution:

Principal repayments are reported as a cash outflow under financing activities on the statement of cash flows, and depending on Proton's reporting policies, interest expense is reported under operating or financing activities on the statement of cash flows. From the previous tables, Year 2 principal repayment is EUR68,301 and interest expense is EUR31,699, for a total of EUR100,000.

Lessee Accounting—US GAAP

Under US GAAP, there are two accounting models for lessees: one for finance leases and another for operating leases. The finance lease accounting model is identical to the lessee accounting model for IFRS. The operating lease accounting model is different.

At operating lease inception, the lessee records a lease payable liability and a corresponding right-of-use asset on its balance sheet that are subsequently reduced by the principal repayment component of the lease payment and amortization, respectively, in the same manner that an IFRS lessee would.

The key difference between an operating lease and a finance lease is how the amortization of the ROU asset is calculated. For an operating lease, the lessee's ROU asset amortization expense is the lease payment minus the interest expense. The implication is that the total expense reported on the income statement (interest plus amortization) will equal the lease payment and that the lease liability and the ROU asset will always equal each other because the principal repayment and amortization are calculated in an identical manner.

The following list shows how the transaction appears on the financial statements:

- The lease liability net of principal repayments and the ROU asset net of accumulated amortization are reported on the balance sheet.
- Interest expense on the lease liability and the amortization expense related to the ROU asset are reported as a single line titled "lease expense" as an operating expense on the income statement. The interest and amortization components are *not* reported separately, nor are they grouped with other types of interest and amortization expense (e.g., interest on a bond, amortization of an intangible asset).
- The entire lease payment is reported as a cash outflow under operating activities on the statement of cash flows. The interest and principal repayment components are *not* reported separately.

EXAMPLE 3**Lessee Accounting—Operating Lease under US GAAP**

Consider the differences in accounting if Proton Enterprises classified the lease of the machinery from Example 2 as an operating lease.

1. How would its financial statements differ, if at all?

Solution:

The first step is to construct the lease liability and ROU asset amortization tables under an operating lease scenario. The lease liability amortization is the same as the finance lease columns FO.1–FO.4 in Example 2.

	Amortization Expense (Lease Payment – Interest)	ROU Asset	Lease Expense (Amortization + Interest)
	0.1	0.2	0.3
Year 0		379,079	
Year 1	62,092	316,987	100,000
Year 2	68,301	248,685	100,000
Year 3	75,131	173,554	100,000
Year 4	82,645	90,909	100,000
Year 5	90,909	0	100,000
Total	379,078		500,000

Now we can compare the financial statement impacts under both finance and operating lease scenarios.

Balance Sheet	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
ROU asset, net: F.2	303,263	227,447	151,631	75,816	0
Lease liability, net: FO.4	316,987	248,685	173,554	90,909	0
<i>Operating lease:</i>					
ROU asset, net: O.2	316,987	248,685	173,554	90,909	0
Lease liability, net: FO.4	316,987	248,685	173,554	90,909	0

The ROU asset is lower in each period under a finance lease because the amortization expense is higher.

Income Statement	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
Amortization: F.1	75,816	75,816	75,816	75,816	75,816
Interest: FO.2	37,908	31,699	24,869	17,355	9,091
Total	113,724	107,515	100,685	93,171	84,907
<i>Operating lease:</i>					
Lease expense: O.3	100,000	100,000	100,000	100,000	100,000

Total expense is higher for a finance lease in Years 1–3 but lower in Years 4 and 5. The largest difference is classification; amortization and interest are presented separately for a finance lease, whereas operating lease expense is an operating expense.

**Statement of Cash
Flows**

	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
Cash flow from operating activities	(37,908)	(31,699)	(24,869)	(17,355)	(9,091)
Cash flow from financing activities	(62,902)	(68,301)	(75,131)	(82,645)	(90,909)
Total	(100,000)	(100,000)	(100,000)	(100,000)	(100,000)
<i>Operating lease:</i>					
Cash flows from operating activities	(100,000)	(100,000)	(100,000)	(100,000)	(100,000)

The difference on the statement of cash flows is only in classification, because in both cases the total cash outflow is equal to the lease payment.

2. How would the classification, all else equal, affect EBITDA margin, total asset turnover, and cash flow per share?

Solution:

The following table shows how the classification affects the indicated financial ratios.

Ratio	Formula	Impact of Using an Operating Lease Instead of a Finance Lease
EBITDA margin	$\frac{\text{EBITDA}}{\text{Total revenues}}$	Lower: Lease expense is classified as an operating expense rather than interest and amortization.
Asset turnover	$\frac{\text{Total revenues}}{\text{Total assets}}$	Lower: Total assets are higher under an operating lease because the ROU asset is amortized at a slower pace in Years 1–3.
Cash flow per share	$\frac{\text{Cash flow from operations}}{\text{Shares outstanding}}$	Lower: Cash flow from operations is lower because the entire lease payment is included in operating activities versus solely interest expense for a finance lease.

Lessor Accounting

The accounting for lessors is substantially identical under IFRS and US GAAP. Under both accounting standards, lessors classify leases as finance or operating leases, which determines the financial reporting. Although lessors under US GAAP recognize finance leases as either “sales-type” or “direct financing,” the distinction is immaterial from an analyst’s perspective.

At finance lease inception, the lessor recognizes a lease receivable asset equal to the present value of future lease payments and de-recognizes the leased asset, simultaneously recognizing any difference as a gain or loss. The discount rate used in the present value calculation is the rate implicit in the lease.

The lease receivable is subsequently reduced by each lease payment using the effective interest method. Each lease payment is composed of interest income, which is the product of the lease receivable and the discount rate, and principal proceeds, which equals the difference between the interest income and cash receipt.

The transaction affects the financial statements in the following ways:

- Lease receivable net of principal proceeds is reported on the balance sheet.
- Interest income is reported on the income statement. If leasing is a primary business activity for the entity, as it commonly is for financial institutions and independent leasing companies, it is reported as revenue.
- The entire cash receipt is reported under operating activities on the statement of cash flows.

The accounting treatment for an operating lease is different: because the contract is essentially a rental agreement, the lessor keeps the leased asset on its books and recognizes lease revenue on a straight-line basis. Interest revenue is not recognized because the transaction is not considered a financing.

The transaction affects the financial statements in the following ways:

- The balance sheet is not affected. The lessor continues to recognize the leased asset at cost net of accumulated depreciation.
- Lease revenue is recognized on a straight-line basis on the income statement. Depreciation expense continues to be recognized.
- The entire cash receipt is reported under operating activities on the statement of cash flows. This is the same as a finance lease.

EXAMPLE 4

Lessor Accounting

Let's examine Proton's machine lease from Example 2 and Example 3 from the perspective of the lessor. Assume that the carrying value of the asset immediately prior to the lease is EUR350,000, accumulated depreciation is zero, and the lessor elects to depreciate it on a straight-line basis over five years.

1. How are the lessor's financial statements affected by the classification of the lease as a finance or operating lease?

Solution:

The difference on the balance sheet is material, because a finance lease requires the lessor to de-recognize the asset and recognize a lease receivable, whereas an operating lease lessor continues to recognize the asset and depreciate it over its useful life. In this case, where the present value of the lease payments is well above the carrying value of the asset, the finance lease classification results in a significant increase in assets.

Balance Sheet	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
Lease receivable, net	316,987	248,685	173,554	90,909	0

Balance Sheet	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Operating lease:</i>					
Property, plant, and equipment, net	280,000	210,000	140,000	70,000	0

The difference on the income statement is also material, because a finance lease lessor recognizes interest revenue under the effective interest method whereas the operating lease lessor recognizes straight-line lease revenue.

Income Statement	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
Interest revenue	37,908	31,699	24,869	17,355	9,091
<i>Operating lease:</i>					
Lease revenue	100,000	100,000	100,000	100,000	100,000

The statement of cash flows, however, is no different for the lessor under a finance or operating lease: The entire cash inflow from the lease payment is recognized under operating activities.

Statement of Cash Flows	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Finance lease:</i>					
Cash flows from operating activities	100,000	100,000	100,000	100,000	100,000
<i>Operating lease:</i>					
Cash flows from operating activities	100,000	100,000	100,000	100,000	100,000

3

FINANCIAL REPORTING FOR POSTEMPLOYMENT AND SHARE-BASED COMPENSATION PLANS



explain the financial reporting of defined contribution, defined benefit, and stock-based compensation plans

Employee Compensation

Employee compensation packages are structured to achieve various objectives, including satisfying employees' needs for liquidity, retaining employees, and motivating employees. Common components of employee compensation are salary, bonuses, health and life insurance premiums, defined contribution and benefit pension plans, and share-based compensation. The amount of compensation and its composition are determined in labor markets, which vary significantly by the types of skills needed, geography, the stage of the business cycle, and labor laws and customs.

The salary component of compensation provides for the liquidity needs of an employee. Bonuses, generally in the form of cash, motivate and reward employees for short- or long-term performance or goal achievement by linking pay to performance. Non-monetary benefits, such as health and life insurance premiums, housing, and vehicles, may be provided to facilitate employees performing their jobs. Salary, bonuses, and non-monetary benefits tend to **vest** (i.e., employee earns the right to the consideration) immediately or shortly after their grant date. In terms of financial reporting, a company reports compensation expense on the income statement in the period in which compensation vests. Immediate or short-term vesting makes the accounting for salary, most non-monetary benefits, and bonuses straightforward: when the employee has earned the salary or bonus, an expense is recorded for the fair value of the compensation, and a cash outflow or accrued compensation liability (a current liability) is recognized. Expenses and cash outflows for short-term compensation tend to be well matched.

Deferred Compensation

Deferred compensation vests over time and can provide valuable retirement savings and financial upside to employees and often serve as an effective retention and stakeholder alignment tool for employers. The financial reporting for deferred compensation plans is generally more complex than that for compensation that vests immediately because of the difficulty in measurement and potential lags between employee service and cash outflows. Employees may earn compensation in the current period but receive consideration in future periods, and the amount of consideration can be based on factors such as their future salary or the employer's stock price. Management judgment and assumptions are required.

Pensions and other postemployment benefit plans are a common type of deferred compensation. Two common types of pension plans are **defined contribution pension plans** and **defined benefit pension plans**. Under a defined-contribution plan, a company contributes an agreed-upon amount into the plan, which may be structured as a match to employees' contributions into the plan (e.g., 50 percent of 5 percent of employees' contribution up to a certain limit). The company contribution is the pension expense and is reported as an operating cash outflow. The only impact on assets and liabilities is a decrease in cash, although if some portion of the agreed-upon amount has not been paid by fiscal year-end, an accrued compensation liability would be recognized on the balance sheet. Because the amount of the contribution is defined and the company has no further obligation once the contribution has been made, accounting for a defined-contribution plan is straightforward.

Companies may also offer other types of postemployment benefit plans, such as retiree healthcare plans. These plans also incur non-current liabilities for employers but tend to be far smaller than pension plans and are typically *not* funded in advance; thus, benefit payments are often expensed as incurred.

Defined-Benefit Pension Plans

Under a defined-benefit pension plan, a company makes promises of future benefits to be paid to the employee during retirement. For example, a company could promise an employee annual pension payments equal to 70 percent of her final salary at retirement until death. Measuring the obligation arising from that promise requires the company to make many assumptions, such as the employee's expected salary at retirement and the number of years the employee is expected to live beyond retirement. The company estimates the future amounts to be paid and discounts the future estimated amounts to a present value (using a discount rate equal to the yield on a

high-quality corporate bond) to determine the pension obligation today. The discount rate and other assumptions used to determine the pension obligation significantly affects the size of the pension obligation.

Most defined-benefit pension plans are funded through assets held in a separate legal entity, typically a pension trust fund. A company makes payments into the pension fund and retirees are paid from the fund. The payments that a company makes into the fund are invested until they are needed to pay the retirees. If the fair value of the plan's assets is higher than the present value of the estimated pension obligation, the plan has a surplus and the company will report a net pension asset on its balance sheet. Conversely, if the present value of the estimated pension obligation exceeds the fair value of the fund's assets, the plan has a deficit and the company will report a net pension liability on its balance sheet.

Accounting for Defined-Benefit Plans under IFRS

Under IFRS, the change in the net pension asset or liability each period is viewed as having three general components. Two of the components of this change are recognized as pension expense on the income statement: (1) employees' service costs, and (2) the net interest expense or income accrued on the beginning net pension asset or liability.

The service cost during the period for an employee is the present value of the increase in the pension benefit earned by the employee as a result of providing one more year of service. The service cost also includes any effects from changes in the plan, known as past service costs.

The net interest expense or income represents the change in the present value of the net defined benefit pension asset or liability from the passage of time (i.e., a liability would increase over time as payout dates near) and is calculated as the net pension asset or liability multiplied by the discount rate.

The third component of the change in the net pension asset or liability during a period (i.e., "remeasurements") is recognized in other comprehensive income. Remeasurements are not amortized into profit or loss over time. Remeasurements include (1) actuarial gains and losses and (2) the actual return on plan assets less any return included in the net interest expense or income. Actuarial gains and losses can occur when changes are made to the assumptions on which a company bases its estimated pension obligation (e.g., employee turnover, mortality rates, retirement ages, compensation increases). The actual return on plan assets includes interest, dividends, and other income derived from the plan assets, including realized and unrealized gains or losses. The actual return typically differs from the amount included in the net interest expense or income, which is calculated using a rate reflective of a high-quality corporate bond yield; plan assets are typically allocated across various asset classes, including equity as well as bonds.

Accounting for Defined-Benefit Plan under US GAAP

Under US GAAP, the change in net pension asset or liability each period is viewed as having five components, some of which are recognized in profit and loss in the period incurred and some of which are recognized in other comprehensive income and amortized into profit and loss over time.

The three components recognized on the income statement in the period incurred are as follows:

1. employees' service costs for the period;
2. interest expense accrued on the beginning pension obligation; and
3. expected return on plan assets, which is a reduction in the amount of expense recognized.

The other two components are past service costs and actuarial gains and losses. Past service costs are recognized in other comprehensive income in the period in which they arise and then subsequently amortized into pension expense over the future service period of the employees covered by the plan. Actuarial gains and losses are typically also recognized in other comprehensive income in the period in which they occur and then amortized into pension expense over time. In effect, this treatment allows companies to “smooth” the effects on pension expense over time for these latter two components. US GAAP does permit companies to immediately recognize actuarial gains and losses in profit and loss.

Pension expense on the income statement is classified on a functional basis like other employee compensation expenses. For a manufacturing company, pension expense related to production employees is added to inventory and expensed through cost of sales (cost of goods sold). For other employees, the pension expense is included in selling, general, and administrative expenses. Therefore, pension expense is typically not directly reported on the income statement. Rather, extensive disclosures are included in the notes to the financial statements.

Exhibit 3 presents excerpts from the balance sheet and pension-related disclosures in BT Group plc’s Annual Report for the year ended 31 March 2018. BT reports under IFRS.

Exhibit 3: BT Group plc: Excerpts from Balance Sheet and Pension-Related Disclosures

Non-current liabilities, GBP millions	Mar. 31, 2018	Mar. 31, 2017	Mar. 31, 2016
Loans and other borrowings	11,994	10,081	11,025
Derivative financial instruments	787	869	863
Retirement benefit obligations	6,371	9,088	6,382
Other payables	1,326	1,298	1,106
Deferred tax liabilities	1,340	1,240	1,262
Provisions	452	536	565
Non-current liabilities	22,270	23,112	21,203

Pension-Related Disclosures

The following are excerpts of pension-related disclosures from BT Group plc’s 2018 Annual Report.

Extract from Note 3 “Summary of Significant Accounting Policies”

Retirement benefits

The group’s net obligation in respect of defined benefit pension plans is the present value of the defined benefit obligation less the fair value of the plan assets.

The calculation of the obligation is performed by a qualified actuary using the projected unit credit method and key actuarial assumptions at the balance sheet date.

The income statement expense is allocated between an operating charge and net finance income or expense. The operating charge reflects the increase in the defined benefit obligation resulting from the pension benefit earned by active employees in the current period, the costs of administering

the plans and any past service costs/credits such as those arising from curtailments or settlements. The net finance income or expense reflects the interest on the net retirement benefit obligations recognised in the group balance sheet, based on the discount rate at the start of the year. Actuarial gains and losses are recognised in full in the period in which they occur and are presented in the group statement of comprehensive income.

The group also operates defined contribution pension plans and the income statement expense represents the contributions payable for the year.

Extract from Note 20 "Retirement Benefit Plans Information on Defined Benefit Pension Plans"

GBP millions	2018	2017	2016
Present value of liabilities	57,327	60,200	50,350
Fair value of plan assets	50,956	51,112	43,968

EXAMPLE 5

BT Group's Pension Plan

Use information in the excerpts in Exhibit 3 to answer the following questions:

1. What type(s) of pension plans does BT have?

Solution:

Note 3 "Summary of Significant Accounting Policies" indicates that the company has both defined contribution and defined benefit pension plans.

2. What proportion of BT's total non-current liabilities are related to its retirement benefit obligations?

Solution:

Retirement benefit obligations represent 29 percent, 39 percent, and 30 percent of BT's total non-current liabilities for the years 2018, 2017, and 2016. Using 2018 to illustrate, $\text{GBP}6,371 / \text{GBP}22,270 = 29\%$. (GBP million)

3. Describe how BT's retirement benefit obligation is calculated.

Solution:

Note 3 "Summary of Significant Accounting Policies" indicates that BT's Retirement benefit obligation is calculated as the present value of the defined benefit obligation minus the fair value of the plan assets.

Using data from Note 20 "Retirement Benefit Plans" the retirement benefit obligation for each year can be calculated. Using 2018 to illustrate, $\text{GBP}57,327 - \text{GBP}50,956 = \text{GBP}6,371$ (GBP million).

Share-Based Compensation

Share-based compensation is intended to align employees' interests with those of the shareholders and is another common type of deferred compensation. Unlike pension plans, share-based compensation tends to be highly concentrated among more senior-level employees such as executives as well as directors. Both IFRS and

US GAAP require a company to disclose in their annual report key elements of management compensation. Regulators may require additional disclosure. The disclosures enable analysts to understand the nature and extent of compensation, including the share-based payment arrangements that existed during the reporting period. In the United States, these disclosures are typically provided in a company's proxy statement that is filed with the SEC. Exhibit 4 shows the disclosure of Apple Inc.'s 2021 Named Executive Officer Compensation:

Exhibit 4: Apple Inc.'s 2021 Named Executive Officer Compensation

Our executive compensation program is designed to motivate and reward outstanding performance in a straightforward, consistent, and effective way, commensurate with Apple's size, performance, and profitability. The compensation of our named executive officers has three basic components: annual base salary, annual cash incentive, and long-term equity awards.

Annual Base Salary

Base salary is a customary, fixed element of compensation intended to attract and retain executives. When setting the annual base salaries of our named executive officers, the Compensation Committee considers market data provided by its independent compensation consultant, internal pay equity, and Apple's financial performance and size relative to peer companies. The annual base salaries for our named executive officers did not change for 2021.

Annual Cash Incentive

Our annual cash incentive program is a performance-based, at-risk component of our named executive officers' compensation. Variable payouts are designed to motivate our named executive officers to deliver strong annual financial results, while advancing Apple values and key community initiatives. The financial performance measures and payout opportunities under the annual incentive program did not change for 2021, although the design of the program was enhanced to include a modifier based on Apple values and key community initiatives ("ESG Modifier"), as described below.

Long-Term Equity Awards

We pay for performance and manage Apple for the long-term. Consistent with this approach and our guiding compensation principles, the majority of our named executive officers' annual compensation is provided in the form of long-term equity incentives that emphasize long-term shareholder value creation and the retention of a strong executive leadership team through a balanced mix of performance-based and time-based RSU awards.

Performance-Based RSUs

RSU awards with performance-based vesting are a substantial, at-risk component of our named executive officers' compensation tied to Apple's long-term performance. The number of performance-based RSUs that vest depends entirely on Apple's total shareholder return relative to the other companies in the S&P 500 ("Relative TSR") for the applicable performance period. To earn a target award, Apple must achieve performance at the 55th percentile of the S&P 500. The Compensation Committee chose Relative TSR as it continues to be an objective and meaningful metric to evaluate our performance against the performance of other large companies and to align the interests of our named executive officers with the interests of our shareholders in creating long-term value.

We measure Relative TSR for the applicable performance period based on the change in each company's stock price during that period, taking into account any dividends paid during that period, which are assumed to be reinvested in the stock. A 20-trading-day averaging period is used to determine the beginning and ending stock price values used to calculate the total shareholder return of Apple and the other companies in the S&P 500. This averaging period mitigates the impact on the long-term Relative TSR results of one-day or short-term stock price fluctuations at the beginning or end of the performance period. The change in stock price value from the beginning to the end of the period is divided by the beginning stock price value to determine TSR.

Time-Based RSUs

RSU awards with time-based vesting align the interests of our named executive officers with the interests of our shareholders by promoting the stability and retention of a high-performing executive team over the longer term. Vesting schedules for time-based awards are generally longer than typical peer company practices, as described below.

Dividend Equivalents

All RSUs granted to our employees in 2021, including our named executive officers, have dividend equivalent rights. The dividend equivalents will only pay out if the time-based vesting and performance conditions have been met for the RSUs to which the dividend equivalents relate.

Source: Apple Inc's 2022 Proxy Statement Form DEF14A, filed 6 January 2022, p. 43.

Share-based compensation, in addition to theoretically aligning the interests of employees with shareholders, has the advantage of potentially requiring no cash outlay. However, share-based compensation is treated as an expense and thus as a reduction of earnings even when no cash changes hands. In addition to decreasing earnings through compensation expense, share-based compensation has the potential to dilute earnings per share. Share-based compensation arrangements can also be cash-settled, which can result in the accrual of a liability.

Although share-based compensation is generally viewed positively as it aligns managers' interests with those of the shareholders, there are several disadvantages. First is that issuing shares to employees dilutes existing shareholders. Second, the recipient may have limited influence over the company's market value (especially with respect to the performance of the broad stock market), so share-based compensation does not necessarily provide the desired incentives and may improperly reward or punish employee performance. Another disadvantage is that the increased ownership may lead managers to be risk averse. Fearing a large market value decline (and loss in individual wealth), shareholder managers may seek less risky (and less profitable) projects. An opposite effect, excessive risk taking, can also occur with the awarding of stock options. Options have skewed payouts that reward the upside while the downside is limited to zero; as a result, managers may seek high-risk, high-reward investments.

For financial reporting of share-based compensation plans, under both IFRS and US GAAP, companies generally estimate the fair value of the share-based compensation at the grant date and recognize it as compensation expense ratably over the plan's vesting schedule. Any changes in the employee's stock price after the grant date does not affect the financial reporting. Specifically, the financial reporting depends on the type of plan. Two common forms of equity-settled share-based compensation are stock grants and stock options.

Stock Grants

A company can grant stock to employees outright, with restrictions, or contingent on performance. For an outright stock grant, compensation expense is reported on the basis of the fair value of the stock on the grant date—generally the market value at grant date. Compensation expense is allocated over the period benefited by the employee's service, referred to as the service period. The employee service period is presumed to be the current period unless there are some specific requirements, such as three years of future service, before the employee is vested (has the right to receive the compensation).

Another type of stock award is a restricted stock grant, which requires the employee to return ownership of those shares to the company if certain conditions are not met. Common restrictions include the requirements that employees remain with the company for a specified period or that certain performance goals are met. Compensation expense for restricted stock grants is measured as the fair value (usually market value) of the shares issued at the grant date. This compensation expense is allocated over the employee's service period.

Shares granted contingent on meeting performance goals are called performance shares. The amount of the grant is usually determined by performance measures other than the change in stock price, such as accounting earnings or return on assets. Basing the grant on accounting performance addresses employees' potential concerns that the stock price is beyond their control and thus should not form the basis for compensation. However, performance shares can potentially have the unintended impact of providing incentives to manipulate accounting numbers. Compensation expense is equal to the fair value (usually market value) of the shares issued at the grant date. This compensation expense is allocated over the employee service period.

Generally, companies have increased their use of stock grants, particularly restricted stock grants in the form of restricted stock units (RSUs), and have decreased their use of stock options to compensate employees over time. Stock grants benefit employees as they are valuable so long as the employer's stock price is greater than zero, while stock options can expire worthless if the employer's stock price does not exceed the exercise price.

Stock Options

Like stock grants, compensation expense related to option grants is reported at fair value under both IFRS and US GAAP. Both require that fair value be estimated using an appropriate valuation model.

Whereas the fair value of stock grants is usually the market value at the date of the grant (adjusted for dividends prior to vesting), the fair value of option grants must be estimated. Companies cannot rely on market prices of options to measure the fair value of employee stock options because features of employee stock options typically differ from traded options. The choice of valuation or option pricing model is one of the critical elements in estimating fair value. Several models are commonly used, such as the Black–Scholes option pricing model or a binomial model. Accounting standards do not prescribe a particular model. Generally, though, the valuation method should (1) be consistent with fair value measurement, (2) be based on established principles of financial economic theory, and (3) reflect all substantive characteristics of the award.

Once a valuation model is selected, a company must determine the inputs to the model, typically including exercise price, stock price volatility, estimated life of each award, estimated number of options that will be forfeited, dividend yield, and the risk-free rate of interest. Some inputs, such as the exercise price, are known at the time of the grant. Other critical inputs are highly subjective—such as stock price volatility or the estimated life of stock options—and can greatly change the estimated

fair value and thus compensation expense. Higher volatility, a longer estimated life, and a higher risk-free interest rate increase the estimated fair value, whereas a higher assumed dividend yield decreases the estimated fair value. Combining different assumptions with alternative valuation models can significantly affect the fair value of employee stock options.

In Exhibit 5, an excerpt from GlaxoSmithKline, plc's 2021 Annual Report explains the assumptions and model used in valuing its stock options.

Exhibit 5: GlaxoSmithKline, plc's Assumptions and Model Used in Valuing Its Stock Option

Share options and savings-related options

For the purposes of valuing savings-related options to arrive at the share-based payment charge, a Black-Scholes option pricing model has been used. The assumptions used in the model are as follows:

	2021 Grant	2020 Grant	2019 Grant
Risk-free interest rate	0.74%	(0.07%)	0.44%
Dividend yield	3.8%	6.2%	4.5%
Volatility	27%	27%	22%
Expected life	3 years	3 years	3 years
Savings-related options grant price (including 20% discount)	£12.07	£10.34	£14.15

Options outstanding

Savings-related share options scheme		
	Number	Weighted exercise price
At 31 December 2021	7,165	£11.58
Range of exercise prices on options outstanding at year end		£10.34–14.15
Weighted average market price on exercise during year		£13.30
Weighted average remaining contractual life		2.1 years

Options over 1.9 million shares were granted during the year under the savings-related share option scheme at a weighted average fair value of £3.22. At 31 December 2021, 5.3 million of the savings-related share options were not exercisable.

There has been no change in the effective exercise price of any outstanding options during the year.

Source: GSK, 2021 Annual Report, p. 246.

Accounting for Stock Options

In accounting for stock options, the basic requirement is that the value of options granted to employees as compensation must be expensed ratably over the period that services are provided. Several important dates affect the accounting, including the grant date, the vesting date, the exercise date, and the expiration date. The **grant date** is the day that options are granted to employees. The **service period** is usually the period between the grant date and the vesting date.

The **vesting date** is the date that employees can first exercise the stock options. The vesting can be immediate or over a future period. If the share-based payments vest immediately (i.e., no further period of service is required), then expense is recognized on the grant date. If the share-based awards do not vest until a specified service period is completed, compensation expense is recognized and allocated over the service period. If the share-based awards are conditional upon the achievement of a performance condition or a market condition (i.e., a target share price), then compensation expense is recognized over the estimated service period. The **exercise date** is the date when employees exercise the options and convert them to stock. If the options go unexercised, they may expire at some predetermined future date, commonly 5 or 10 years from the grant date.

The grant date is also the date that compensation expense is measured if both the number of shares and the option price are known. If facts affecting the value of options granted depend on events after the grant date, then compensation expense is measured when those facts are known.

EXAMPLE 6

Disclosure of Stock Options' Current Compensation Expense, Vesting, and Future Compensation Expense

Exhibit 6: Excerpts from Note 12—Stock Compensation Plans in the Notes to Financial Statements of Coca Cola, Inc.

Our Company grants long-term equity awards under its stock-based compensation plans to certain employees of the Company.

Total stock-based compensation expense was \$337 million, \$141 million and \$201 million in 2021, 2020 and 2019, respectively. In 2020, for certain employees who accepted voluntary separation from the Company as a result of our strategic realignment initiatives, the Company modified their outstanding equity awards granted prior to 2020 so that the employees

As of December 31, 2021, we had \$335 million of total unrecognized compensation cost related to nonvested stock-based compensation awards granted under our plans, which we expect to recognize over a weighted-average period of 1.9 years as stock-based compensation expense. This expected cost does not include the impact of any future stockbased compensation awards.

Source: Coca Cola, Inc. Form 10-K, filed 22 February 2022.

Using the information in Exhibit 6, from Coca Cola, Inc.'s Notes to Financial Statements, determine the following:

1. Total compensation expense relating to options already granted that will be recognized in future years as options vest.

Solution:

Coca Cola, Inc. discloses that unrecognized compensation expense relating to stock options already granted, but not yet vested, totals USD335 million.

2. Approximate compensation expense in 2022 and 2023 relating to options already granted.

Solution:

The options already granted will vest over the next 1.9 years. Compensation expense related to stock options already granted will be USD176 million ($\text{USD335}/1.9$ years) in 2022 and USD159 million in 2023 (USD335 total less USD176 expensed in 2022). New options granted in the future will likely raise the total reported compensation expense.

When an option is exercised, the market price of the option at the time of exercise is not relevant. The amount of expense is determined based on the fair value of the option at the grant date. The fair value amount is recognized as compensation expense over the vesting period.

The exercise of an option is accounted for in a similar way to the issuance of stock. Upon exercise, the company increases its cash for the exercise price of the option (paid by the option holder) and credits common stock for the par value of the stock issued. Additional paid-in capital is increased by the difference between the par value of the stock and the sum of the fair value of the option at the grant date and the cash received.

In sum, the key accounting requirements are as follows:

1. Recognize compensation expense based on the fair value of the award. Since no cash is exchanged upon the grant, the offsetting account for the compensation expense is additional paid in capital.
2. The grant date fair value is recognized as compensation expense over the vesting period.
3. Upon exercise, the company increases equity by the fair value of the options on the grant date plus the cash provided by the employee upon exercise.

As the option expense is recognized over the relevant vesting period, the impact on the financial statements is to ultimately reduce retained earnings (as with any other expense). The offsetting entry is an increase in paid-in capital. Thus, the recognition of option expense has no net impact on total equity.

Other Types of Share-Based Compensation

Both stock grants and stock options allow the employee to obtain ownership in the company. Other types of share-based compensation, such as stock appreciation rights (SARs) or phantom stock, compensate an employee on the basis of changes in the value of shares without requiring the employee to hold the shares. These are referred to as cash-settled share-based compensation. With SARs, an employee's compensation is based on increases in a company's share price. Like other forms of share-based compensation, SARs serve to motivate employees and align their interests with shareholders. The following are two additional advantages of SARs:

- The potential for risk aversion is limited because employees have limited downside risk and unlimited upside potential similar to employee stock options.
- Shareholder ownership is not diluted.

Similar to other share-based compensation, SARs are valued at fair value and compensation expense is allocated over the service period of the employee. While phantom share plans are similar to other types of share-based compensation, they differ somewhat because compensation is based on the performance of hypothetical stock rather than the company's actual stock. Unlike SARs, phantom shares can be used by private companies or business units within a company that are not publicly traded or by highly illiquid companies.

PRESENTATION AND DISCLOSURE

4



describe the financial statement presentation of and disclosures relating to long-term liabilities and share-based compensation

This lesson examines the presentation and disclosure requirements for leases, post-retirement benefits, and share-based compensation. These disclosures are typically included as notes to the financial statements.

Presentation and Disclosure of Leases

Both IFRS and US GAAP indicate that the objective of lease disclosure is to provide the user of the financial statement with information to assess the amount, timing and uncertainty of cash flows associated with leases.

The non-current portion of the balance sheet will typically contain a "right of use" asset and the non-current (long-term) liabilities section will typically show the lease liability. However, depending on the size of leased assets and lease obligations, some companies may not have discrete lease line items on the balance sheet and instead will report leases in "Other assets" or "Other liabilities." In addition to amounts reported on the balance sheet, both lessees and lessors must disclose quantitative and qualitative information about its leases, significant judgments made to comply with lease accounting requirements and the amounts recognized in the financial statements relating to those leases and their location on the statements.

Lessee Disclosure

Specifically, as indicated in IFRS 16, lessee disclosures must include the following amounts for the current reporting period:

- the carrying amount of right of use assets and the end of the reporting period by class of underlying asset;
- total cash outflow for leases;
- interest expense on lease liabilities;
- depreciation charges for right-of-use assets by class of underlying asset; and
- additions to right of use assets.

In addition, lessees should disclose a maturity analysis of lease liabilities (separately from the maturity analysis of other financial liabilities like bonds and loans) and additional quantitative and qualitative information about leasing activity to enable users of financial statements to assess the nature of the lessee's leasing activities and future cash outflows. This analysis should include the following:

- the nature of the lessee's leasing activities;

- future cash outflows to which the lessee is potentially exposed that are not reflected in the measurement of lease liabilities;
- restrictions or covenants imposed by leases; and
- sale and leaseback transactions.

Exhibit 7 is a reproduction of Apple's Corp's lease disclosure in its notes to financial statements.

Exhibit 7: Apple Corp's 2021 Lease Note

Note 6 - Leases

The Company has lease arrangements for certain equipment and facilities, including retail, corporate, manufacturing and data center space. These leases typically have original terms not exceeding 10 years and generally contain multiyear renewal options, some of which are reasonably certain of exercise. The Company's lease arrangements may contain both lease and nonlease components. The Company has elected to combine and account for lease and nonlease components as a single lease component for leases of retail, corporate, and data center facilities.

Payments under the Company's lease arrangements may be fixed or variable, and variable lease payments are primarily based on purchases of output of the underlying leased assets. Lease costs associated with fixed payments on the Company's operating leases were \$1.7 billion and \$1.5 billion for 2021 and 2020, respectively. Lease costs associated with variable payments on the Company's leases were \$12.9 billion and \$9.3 billion for 2021 and 2020, respectively. Rent expense for operating leases, as previously reported under former lease accounting standards, was \$1.3 billion in 2019.

The Company made \$1.4 billion and \$1.5 billion of fixed cash payments related to operating leases in 2021 and 2020, respectively. Noncash activities involving right-of-use ("ROU") assets obtained in exchange for lease liabilities were \$3.3 billion for 2021 and \$10.5 billion for 2020, including the impact of adopting FASB ASU No. 2016-02, Leases (Topic 842) in the first quarter of 2020.

The following table shows ROU assets and lease liabilities, and the associated financial statement line items, as of September 25, 2021 and September 26, 2020 (in millions of USD):

Lease-Related Assets and Liabilities	Financial Statement Line Items	2021	2020
<i>Right-of-use assets:</i>			
Operating leases	Other non-current assets	10,087	8,570
Finance leases	Property, plant and equipment, net	861	629
Total right-of-use assets		10,948	9,199
<i>Lease liabilities:</i>			
Operating leases	Other current liabilities	1,449	1,436
	Other non-current liabilities	9,506	7,745
Finance leases	Other current liabilities	79	24
	Other non-current liabilities	769	637
Total lease liabilities		11,803	9,482

Lease liability maturities as of 25 September 2021 are as follows (in millions of USD):

	Operating Leases	Finance Leases	Total
2022	1,629	104	1,733
2023	1,560	123	1,683
2024	1,499	99	1,598
2025	1,251	46	1,297
2026	1,061	26	1,087
Thereafter	5,187	868	6,055
Total undiscounted liabilities	12,187	1,266	13,453
Less: imputed interest	(1,232)	(418)	(1,650)
Total lease liabilities	10,955	848	11,803

The weighted-average remaining lease term related to the Company's lease liabilities as of September 25, 2021 and September 26, 2020 was 10.8 years and 10.3 years, respectively.

The discount rate related to the Company's lease liabilities as of both September 25, 2021 and September 26, 2020 was 2.0%. The discount rates are generally based on estimates of the Company's incremental borrowing rate, as the discount rates implicit in the Company's leases cannot be readily determined.

As of September 25, 2021, the Company had \$1.1 billion of future payments under additional leases, primarily for corporate facilities and retail space, that had not yet commenced. These leases will commence between 2022 and 2023, with lease terms ranging from 3 years to 20 years.

Source: Apple Corp. 2021 Annual Report on Form 10-K.

Lessor Disclosure

IFRS 16 specifies different disclosure requirements for lessors. Similar to lessees, lessors must disclose information (either in the notes or the financial statements) that enables users of financial statements to assess the effect that leases have on the financial position, performance, and cash flows of the lessor. At a minimum, lessors should disclose:

- for finance leases,
- the amount of selling profit or loss; and
- finance income on the net investment in the lease; and income relating to variable lease payments not included in the measurement of the lease;
- for operating leases, lease income with separate disclosure for income relating to variable lease payments not based on an index or rate.

In addition, a lessor must provide additional qualitative and quantitative information about its leasing activities, including information to help users assess the nature of the lessor's leasing activities and how the lessor manages risk associated with any rights it retains in the underlying leased assets.

For finance leases, lessors should provide a qualitative and quantitative explanation of significant changes in the carrying amount of the net investment, along with a maturity analysis of the lease payments receivable showing undiscounted lease payments to be received on an annual basis for a minimum of each of the first five years and a total amount for any remaining years.

For operating leases, a lessor should disclose disaggregated information about each class of property, plant, and equipment subject to operating leases and disclose a maturity analysis of lease payments showing the undiscounted lease payments to be received on an annual basis for a minimum of each of the first five years and a total of the amounts for the remaining years.

Presentation and Disclosure of Postemployment Plans

Disclosures for defined benefit and defined contribution pension plans are typically included as a note to the financial statements, with disclosures for defined benefit plans being far more extensive. For defined contribution plans, International Accounting Standard 19 (IAS 19) requires issuers to simply disclose the amount recognized on the income statement during the period. Regulators can require more extensive disclosures. For example, the US SEC requires issuers to file a separate annual report on Form 11-K for employee benefit plans that includes audited plan financial statements and descriptions of the plan's structure and holdings.

IAS 19 defines the following objectives for issuers' disclosures of their defined benefit pension plans:

- explain the characteristics of its defined benefit plans and risks associated with them;
- identify and explain the amounts in its financial statements arising from its defined benefit plans (i.e., the net pension asset or liability); and
- describe how its defined benefit plans may affect the amount, timing and uncertainty of the entity's future cash flows.

While IAS 19 is principles-based, giving issuers discretion in how best to achieve the disclosure objectives, it does give several specific prescriptions, requiring issuers to make disclosures, such as the following:

- the nature of benefits provided, the regulatory framework in which the plan operates, governance of the plan, and risks to which the plan exposes the entity;
- a reconciliation from the opening balance to the closing balance of the net pension asset or liability, with separate reconciliations for plan assets and the present value of the defined benefit obligation, showing service costs, interest income or expense, remeasurements, past service costs, contributions to the plan, and other components of the change;
- a sensitivity analysis showing how changes in significant assumptions (such as the discount rate used to measure the defined benefit pension obligation) would affect the amounts reported on the financial statements;
- the composition of plan assets by category, such as equity securities, fixed-income securities, and real estate; and
- indications of the effect of the defined benefit pension plans on the entity's future cash flows.

The disclosures in Exhibit 8 are included in the 2021 Annual Report of Roche AG, a Swiss biopharmaceutical and diagnostics company. Roche provides extensive detail on its postemployment plans in a note to its financial statements titled "Pensions and other postemployment benefits."

Exhibit 8: Roche AG's Pensions and Other Postemployment Benefits**Note 26. Pensions and other post-employment benefits**

[Roche AG's] ("Group") objective is to provide attractive and competitive post-employment benefits to employees, while at the same time ensuring that the various plans are appropriately financed and managing any potential impacts on the Group's long-term financial position. Most employees are covered by pension plans sponsored by Group companies. The nature of such plans varies according to legal regulations, fiscal requirements and market practice in the countries in which the employees are employed. Post-employment benefit plans are classified for IFRS as 'defined contribution plans' if the Group pays fixed contributions into a separate fund or to a third-party financial institution and will have no further legal or constructive obligation to pay further contributions. All other plans are classified as 'defined benefit plans'

Defined contribution plans

Defined contribution plans are funded through payments by employees and by the Group to funds administered by third parties. The Group's expenses for these plans were CHF 419 million (2020: CHF 409 million). No assets or liabilities are recognised in the Group's balance sheet in respect of such plans, apart from regular prepayments and accruals of the contributions withheld from employees' wages and salaries and of the Group's contributions. The Group's major defined contribution plan is the US Roche 401(k) Savings Plan.

Defined benefit plans

Plans are usually established as trusts independent of the Group and are funded by payments from Group companies and by employees. In some cases, notably for the major defined benefit plans in Germany, the plans are unfunded and the Group pays pensions to retired employees directly from its own financial resources. Plans are usually governed by a senior governing body, such as a Board of Trustees, which is typically composed of both employee and employer representatives. Funding of these plans is determined by local regulations using independent actuarial valuations. Separate independent actuarial valuations are prepared in accordance with the requirements of IAS 19 for use in the Group's financial statements. The Group's major pension plans are located in Switzerland, the US and Germany, which in total account for 85% of the Group's defined benefit obligation (2020: 85%).

Defined Benefit Plans: Income Statement (in millions of CHF)

	2021			2020		
	Pension plans	Other post-employment benefit plans	Total expense	Pension plans	Other post-employment benefit plans	Total expense
Current service cost	695	13	708	644	13	657
Past service cost (income)	(30)	0	(30)	1	0	1
Settlement (gain) loss	0	0	0	(2)	0	(2)
Total operating expenses	665	13	678	643	13	656

	2021			2020		
	Pension plans	Other post-employment benefit plans	Total expense	Pension plans	Other post-employment benefit plans	Total expense
Net interest cost of defined benefit plans	53	18	71	78	23	101
Total expense recognized on the income statement	718	31	749	721	36	757

Defined Benefit Plans: Funding Status (in millions of CHF)

	2021			2020		
	Pension plans	Other post-employment benefit plans	Total expense	Pension plans	Other post-employment benefit plans	Total expense
Funded plans:						
Fair value of plan assets	18,817	347	19,164	17,639	328	17,967
Defined benefit obligation	(17,609)	(683)	(18,292)	(18,290)	(757)	(19,047)
Over (under) funding	1,208	(336)	872	(651)	(429)	(1,080)
Unfunded plans:						
Defined benefit obligation	(5,211)	(371)	(5,582)	(5,506)	(396)	(5,902)
Total funding status	(4,003)	(707)	(4,710)	(6,157)	(825)	(6,982)
Limit on asset recognition	(3)	0	(3)	0	0	0
Reimbursement rights	0	108	108	0	118	118
Net recognized asset (liability)	(4,006)	(599)	(4,605)	(6,157)	(707)	(6,864)

Defined Benefit Plans: Cash Flows (in millions of CHF)

	2021	2020
Employer contributions, net of reimbursements – funded plans	(413)	(410)
Benefits paid – unfunded plans	(206)	(191)
Total cash inflow (outflow)	(619)	(601)

Based on the most recent actuarial valuations, the Group expects that employer contributions for funded plans in 2022 will be approximately CHF 411 million, which includes an estimated CHF 10 million of additional voluntary contributions related to the Chugai benefit plans. Benefits paid for unfunded plans in 2022 are estimated to be approximately CHF 204 million, which mostly relate to the German defined benefit plans.

Source: Roche AG 2021 Finance Report.

Presentation and Disclosure of Share-Based Compensation

Companies are required to provide disclosures about their share-based compensation programs that enable users of the financial statements to understand the nature and extent of share-based payment arrangements, including the current expected future cash flows and expenses relating to those plans. Issuers typically include these disclosures in a note to the financial statements. As specified in IFRS 2, required disclosures include the following:

- A description of each type of share-based payment arrangement, including its general terms and conditions, such as vesting requirements, the maximum term of options granted and the method of settlement (i.e., cash or equity)
- Details about the number and weighted average exercises price of options, including:
 - the number outstanding at the beginning of the period,
 - granted during the period,
 - forfeited during the period,
 - exercised during the period,
 - expired during the period,
 - outstanding at the end of the period, and
 - exercisable at the end of the period.
- For other equity instruments granted during the period (i.e., other than share options), the number and weighted average fair value of those equity instruments at the measurement date, and information on how that fair value was measured.

Exhibit 9 is an excerpt of Apple Inc.'s note disclosure for its share-based compensation, which is composed of grants of RSUs and an employee stock purchase plan. Note that Apple Inc.'s share price at the last balance sheet date (25 September 2021) was USD146.10, up significantly over the prior three years, which is evident in the increase in the fair value of RSU grants. Second, Apple Inc.'s primary share-based compensation plan is named the "2014 Employee Stock Plan." The name of these plans usually refers to the date it was approved by shareholders. A new plan, with a new date name, can be created at the discretion of the board and submitted to a shareholder vote; the company does not necessarily have to wait until all stock grants under the prior plan have been made, however. Some issuers will have several active stock compensation plans outstanding.

Exhibit 9: Apple Inc. 2021 Note Disclosure on Share-Based Compensation

2014 Employee Stock Plan

The 2014 Employee Stock Plan (the "2014 Plan") is a shareholder-approved plan that provides for broad-based equity grants to employees, including executive officers, and permits the granting of restricted stock units ("RSUs"), stock grants, performance-based awards, stock options and stock appreciation rights, as well as cash bonus awards. RSUs granted under the 2014 Plan generally vest over four years, based on continued employment, and are settled upon vesting in shares of the Company's common stock on a one-for-one basis. RSUs granted under the 2014 Plan reduce the number of shares available for grant under the plan by a factor of two times the number of RSUs granted. RSUs canceled and

shares withheld to satisfy tax withholding obligations increase the number of shares available for grant under the 2014 Plan utilizing a factor of two times the number of RSUs canceled or shares withheld. All RSUs granted under the 2014 Plan have dividend equivalent rights (“DERs”), which entitle holders of RSUs to the same dividend value per share as holders of common stock. DERs are subject to the same vesting and other terms and conditions as the underlying RSUs. As of September 25, 2021, approximately 760 million shares were reserved for future issuance under the 2014 Plan. Shares subject to outstanding awards under the 2003 Employee Stock Plan that expire, are canceled or otherwise terminate, or are withheld to satisfy tax withholding obligations for RSUs, will also be available for awards under the 2014 Plan.

Employee Stock Purchase Plan

The Employee Stock Purchase Plan (the “Purchase Plan”) is a shareholder-approved plan under which substantially all employees may voluntarily enroll to purchase the Company’s common stock through payroll deductions at a price equal to 85% of the lower of the fair market values of the stock as of the beginning or the end of six-month offering periods. An employee’s payroll deductions under the Purchase Plan are limited to 10% of the employee’s compensation and employees may not purchase more than \$25,000 of stock during any calendar year. As of September 25, 2021, approximately 96 million shares were reserved for future issuance under the Purchase Plan.

Restricted Stock Units

A summary of the Company’s RSU activity and related information for 2021, 2020 and 2019, is as follows:

	Number of RSUs (thousands)	Weighted-Average Grant Date Fair Value per RSU	Aggregate Fair Value (millions)
Balance as of 29 September, 2018	368,618	33.65	
RSUs granted	147,409	53.99	
RSUs vested	(168,350)	33.80	
RSUs canceled	(21,609)	40.71	
Balance as of 28 September, 2019	326,068	42.30	
RSUs granted	156,800	59.20	
RSUs vested	(157,743)	40.29	
RSUs canceled	(14,347)	48.07	
Balance as of 26 September, 2020	310,778	51.58	
RSUs granted	89,363	116.33	
RSUs vested	(145,766)	50.71	
RSUs canceled	(13,948)	68.95	
Balance as of 25 September, 2021	240,427	75.16	35,324

The fair value as of the respective vesting dates of RSUs was \$19.0 billion, \$10.8 billion and \$8.6 billion for 2021, 2020 and 2019, respectively. The majority of RSUs that vested in 2021, 2020 and 2019 were net share settled such that the Company withheld shares with a value equivalent to the employees’ obligation for

the applicable income and other employment taxes, and remitted the cash to the appropriate taxing authorities. The total shares withheld were approximately 53 million, 56 million and 59 million for 2021, 2020 and 2019, respectively, and were based on the value of the RSUs on their respective vesting dates as determined by the Company's closing stock price. Total payments for the employees' tax obligations to taxing authorities were \$6.8 billion, \$3.9 billion and \$3.0 billion in 2021, 2020 and 2019, respectively.

As of September 25, 2021, the total unrecognized compensation cost related to outstanding RSUs and stock options was \$13.6 billion, which the Company expects to recognize over a weighted-average period of 2.5 years.

Source: Apple Inc., 2021 Annual Report on Form 10-K, p. 47.

PRACTICE PROBLEMS

1. Which of the following is a potential drawback of compensating employees with stock options?
 - A. The grant may make employees adverse to risk.
 - B. The grant may make employees seek more risk.
 - C. Both of the above are potential drawbacks.:
2. Which of the following is typically an objective of a share-based compensation plan?
 - A. Attracting new employees
 - B. Maximizing executive compensation
 - C. Alignment of employees' interest with those of management
3. Which of the following statements is true?
 - A. Share-based compensation does not have to be treated as an expense, when no cash is exchanged.
 - B. Share-based compensation programs can take a variety of forms, including those that are equity-settled and those that are cash settled.
 - C. Employees will receive a benefit of the stock option as long as they work long enough for the option to vest.
4. Which of the following is a difference between a stock grant and a stock option grant?
 - A. Whereas the fair value of stock grants is usually based on the market value at the date of the grant, the fair value of option grants must be estimated.
 - B. Companies account for stock grants by allocating compensation expense over the employee service period, whereas compensation expense for stock options is expensed immediately.
 - C. Compensation expense is determined based on the market value of a share of stock on the grant date, whereas the measurement date for the value of an option is when the employee exercises the option.
5. Assume ABC Company, a fictional company provides the following disclosure about its stock compensation plans:

"The average fair value of shares granted was USD20.86, USD16.42, and USD17.80 in 2021, 2020, and 2019 respectively." If the company granted 18,000 shares, with a three-year vesting period in 2021, what is the annual compensation expense for the 2021 shares granted?

 - A. USD125,160
 - B. USD339,480
 - C. USD375,480

6. Assume XYZ Company discloses the following information in its Stock Compensation note: As of 31 December 2021, we had USD630 million of unrecognized compensation cost related to nonvested stock-based compensation awards granted under our plan. We expect to recognize this cost over a weighted average period of 3.2 years as stock-based compensation expense. What is the expected compensation expense in 2025?
- A. USD39 million
 - B. USD197 million
 - C. USD630 million
7. Beginning with fiscal year 2019, for leases with a term longer than one year, lessees report a right-to-use asset and a lease liability on the balance sheet:
- A. only for finance leases.
 - B. only for operating leases.
 - C. for both finance and operating leases.
8. For a lessor, the leased asset appears on the balance sheet and continues to be depreciated when the lease is classified as:
- A. a finance lease.
 - B. a sales-type lease.
 - C. an operating lease.
9. Under US GAAP, a lessor's reported revenues at lease inception will be *highest* if the lease is classified as:
- A. a sales-type lease.
 - B. an operating lease.
 - C. a direct financing lease.
10. Under both IFRS and US GAAP, a lessor in an operating lease recognizes:
- A. selling profit at lease inception.
 - B. a lease asset comprising the lease receivable and relevant residual value at lease inception.
 - C. lease receipts as income and related costs, including depreciation, as expenses over the lease term.
11. Compared with a finance lease, an operating lease:
- A. is similar to renting an asset.
 - B. is equivalent to the purchase of an asset.
 - C. has a term for the majority of the economic life of the leased asset.
12. Under US GAAP, a lessee's accounting for a long-term finance lease after incep-

tion will include:

- A. recognizing a single lease expense.
 - B. recording depreciation expense on the right-of-use asset.
 - C. increasing the balance of the lease liability by a portion of the lease payment.
13. A company enters into a finance lease agreement to acquire the use of an asset for three years with lease payments of EUR19,000,000 starting next year. The leased asset has a fair market value of EUR49,000,000 and the present value of the lease payments is EUR47,250,188. Based on this information, the value of the lease liability reported on the company's balance sheet at lease inception is *closest* to:
- A. EUR47,250,188.
 - B. EUR49,000,000.
 - C. EUR57,000,000.
14. Penben Corporation has a defined benefit pension plan. At 31 December, its pension obligation is EUR10 million and pension assets are EUR9 million. Under either IFRS or US GAAP, the reporting on the balance sheet would be *closest* to which of the following?
- A. EUR10 million is shown as a liability, and EUR9 million appears as an asset.
 - B. EUR1 million is shown as a net pension obligation.
 - C. Pension assets and obligations are not required to be shown on the balance sheet but only disclosed in footnotes.
15. The information below is associated with a company that offers its employees a defined benefit plan:
- | | |
|--|------------------|
| Fair value of fund's assets | USD1,500,000,000 |
| Estimated pension obligations | USD2,600,000,000 |
| Present value of estimated pension obligations | USD1,200,000,000 |
- Based on this information, the company's balance sheet will present a net pension:
- A. asset of USD300,000,000.
 - B. asset of USD1,400,000,000.
 - C. liability of USD1,100,000,000.

SOLUTIONS

1. C is correct. Stock option grants may lead managers to be either risk adverse or have the opposite effect (i.e., encourage excessive risk taking). Therefore, B and C are both potential drawbacks.
2. The correct answer is A. The objectives of employee compensation plans include attracting new employees, retaining and motivating existing employees and aligning employee interests with those of shareholders. Answer B, maximizing executive compensation is not typically an objective of a share-based compensation programs. Answer C is not correct because an objective is to align employee interests with shareholders, not necessarily management.
3. The correct answer is B. There are numerous types of share-based compensation programs; some result in the issuance of shares to employees, and others result in a cash payment based on the value of company shares. Answer A is not correct because even if no cash is exchanged at the time of grant, the compensation expense is recognized based on the fair value of the grant. Answer C is not correct because, in some cases, employees may not receive the benefit of a stock option. For example, if the stock option expires when the exercise price exceeds the market value of the company's stock, the recipient may not benefit from the grant.
4. A is correct. The compensation for a stock grant is based on the market value at the date of the stock grant. For a stock option, the value is not definitively known and must be estimated. Answer B is not correct because companies account for both stock grants and option grants by allocating the value of the grant over the service period (often the vesting period). Answer C is not correct because for both a share grant and an option grant, the value of the grant is determined based on the date of the grant.
5. The correct answer is A, calculated as follows: 18,000 shares $\times$ by average fair value at grant date of USD20.86 = USD375,480 total compensation. Divide this amount by the three-year vesting period, and the result is USD125,160 annual compensation expense.
6. The correct answer is A. USD39 million calculated as follows: USD630 million/3.2 years = USD197 million per year for years 2022, 2023, and 2024. The amount remaining in 2025 would be USD39 million: USD630 – USD197 – USD197 – USD197 = USD39 million.
7. C is correct. Beginning with fiscal year 2019, lessees report a right-of-use asset and a lease liability for all leases longer than one year. An exception under IFRS exists for leases when the underlying asset is of low value.
8. C is correct. When a lease is classified as an operating lease, the underlying asset remains on the lessor's balance sheet. The lessor will record a depreciation expense that reduces the asset's value over time.
9. A is correct. A sales-type lease treats the lease as a sale of the asset, and revenue is recorded at the time of sale equal to the value of the leased asset. Under a direct financing lease, only interest income is reported as earned. Under an operating lease, revenue from lease receipts is reported when collected.
10. C is correct. Lessor accounting for an operating lease under US GAAP is similar to that under IFRS: Over the lease term, the lessor recognizes lease receipts

as income and recognizes related costs, including depreciation of the leased asset, as expenses. Under IFRS, at inception of a finance lease—not an operating lease—the lessor derecognizes the underlying leased asset and recognizes a lease asset comprising the lease receivable and relevant residual value. Further, an IFRS-reporting lessor will recognize selling profit at the beginning of all leases that are not classified as operating leases. In contrast, a US GAAP-reporting lessor will recognize selling profit only on sales-type leases at the beginning of the lease term.

11. A is correct. An operating lease is an agreement that allows the lessee to use an asset for a period of time. Thus, an operating lease is similar to renting an asset, whereas a finance lease is equivalent to the purchase of an asset by the lessee that is directly financed by the lessor.
12. B is correct. A lessee's accounting for a long-term finance lease under US GAAP and after lease inception includes recording depreciation expense on the right-of-use asset, recognizing interest expense on the lease liability, and reducing the balance of the lease liability for the portion of the lease payments that represents repayment of the lease liability. A lessee's accounting for an operating lease under US GAAP and after lease inception will recognize a single lease expense, which is a straight-line allocation of the cost of the lease over its term.
13. A is correct. Under the revised reporting standards under IFRS and US GAAP, a lessee must recognize an asset and a lease liability at inception of each of its leases (with an exception for short-term leases). The lessee reports a right-of-use (ROU) asset and a lease liability, calculated essentially as the present value of fixed lease payments, on its balance sheet. Thus, at lease inception, the company will record a lease liability on the balance sheet of EUR47,250,188.
14. B is correct. The company will report a net pension obligation of EUR1 million equal to the pension obligation (EUR10 million) less the plan assets (EUR9 million).
15. A is correct. A company that offers a defined benefit plan makes payments into a pension fund and the retirees are paid from the fund. The payments that a company makes into the fund are invested until they are needed to pay retirees. If the fair value of the fund's assets is higher than the present value of the estimated pension obligation, the plan has a surplus and the company's balance sheet will reflect a net pension asset. Because the fair value of the fund's assets is USD1,500,000,000 and the present value of estimated pension obligations is USD1,200,000,000, the company will present a net pension asset of USD300,000,000 on its balance sheet.