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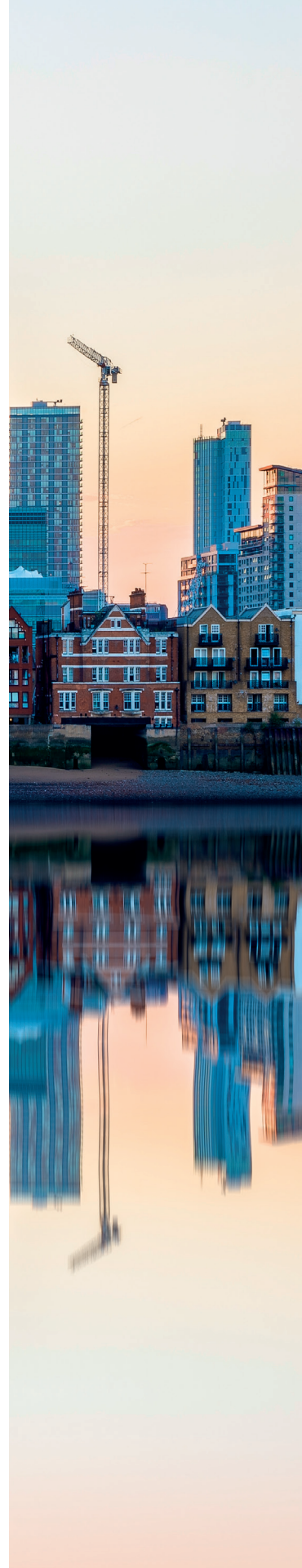
JONATHAN BERK
STANFORD UNIVERSITY

PETER DEMARZO
STANFORD UNIVERSITY



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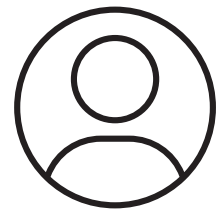
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and joy. —J. B.*

*To Kauai, Pono, Koa, and Kai, for all the love
and laughter —P. D.*

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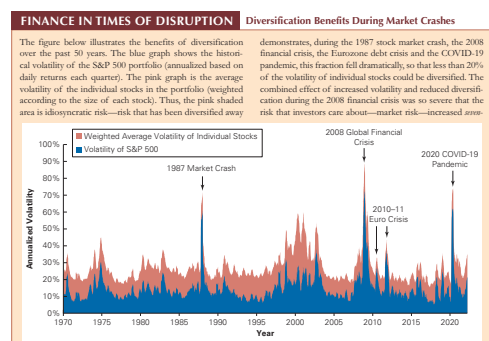
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Bridging Theory and Practice

The Law of One Price as the Unifying Valuation Framework

The Law of One Price framework reflects the modern idea that the absence of arbitrage is the unifying concept of valuation. This critical insight is introduced in Chapter 3, revisited in each part opener, and integrated throughout the text—motivating all major concepts and connecting theory to practice.



Focus on Financial Crises and Disruptions

Finance in Times of Disruption boxes reflect the reality of the recent COVID-19 pandemic, the global financial crisis, and sovereign debt crises, illustrating important lessons learned. Twenty-four boxes across the book illustrate and analyze key details.

Study Aids with a Practical Focus

To be successful, students need to master the core concepts and learn to identify and solve problems that today's practitioners face.

Common Mistakes boxes alert students to frequently made mistakes stemming from misunderstanding core concepts and calculations—in the classroom and in the field.

COMMON MISTAKE Discounting One Too Many Times

The perpetuity formula assumes that the first payment occurs at the end of the first period (at date 1). Sometimes perpetuities have cash flows that start later in the future. In this case, we can adapt the perpetuity formula to compute the present value, but we need to do so carefully to avoid a common mistake.

To illustrate, consider the MBA graduation party described in Example 4.7. Rather than starting immediately, suppose that the first party will be held two years from today (for the current entering class). How would this delay change the amount of the donation required?

Now the timeline looks like this:

We need to determine the present value of these cash flows, as it tells us the amount of money in the bank needed today to finance the future parties. We cannot apply the perpetuity formula directly, however, because these cash flows are not *exactly* a perpetuity as we defined it. Specifically, the cash flow in the first period is “missing.” But consider the situation on date 1—at that point,

the first party is one period away and then the cash flows are periodic. From the perspective of date 1, this *is* a perpetuity, and we can apply the formula. From the preceding calculation, we know we need \$375,000 on date 1 to have enough to start the parties on date 2. We rewrite the timeline as follows:

Our goal can now be restated more simply: How much do we need to invest today to have \$375,000 in one year? This is a simple present value calculation:

$$PV = \$375,000 / 1.08 = \$347,222 \text{ today}$$

A common mistake is to discount the \$375,000 twice because the first party is in two periods. *Remember—the present value formula for the perpetuity already discounts the cash flows to one period prior to the first cash flow.* Keep in mind that this common mistake may be made with perpetuities, annuities, and all of the other special cases discussed in this section. All of these formulas discount the cash flows to one period prior to the first cash flow.

EXAMPLE 4.14 Evaluating an Annuity with Monthly Cash Flows

Problem
You are about to purchase a new car and have two options to pay for it. You can pay \$20,000 in cash immediately, or you can get a loan that requires you to pay \$500 each month for the next 48 months (four years). If the monthly interest rate you earn on your cash is 0.5%, which option should you take?

Solution
Let's start by writing down the timeline of the loan payments:

The timeline shows that the loan is a 48-period annuity. Using the annuity formula the present value is

$$PV(48\text{-period annuity of } \$500) = \$500 \times \frac{1 - \frac{1}{1.005^{48}}}{0.005} = \$21,290$$

Alternatively, we may use the annuity spreadsheet to solve the problem:

	PERIOD	RATE	PV	PMT	FV	Excel Formula
Given	48	0.5%		500	0	
Solve for PV			(21,290)			=PV(0.005,48,500,0)

Thus, taking the loan is equivalent to paying \$21,290 today. So, by paying \$20,000 in cash rather than taking the loan, you save the equivalent of \$1,290 today.

Fahmi Quadir is the Founder and Chief Investment Officer of Sukhesh Capital Management, a firm that focuses on short-selling by deploying investigative and forensic methods to identify businesses potentially engaged in fraud, money laundering, and other predatory activity.

INTERVIEW WITH FAHMI QUADIR

QUESTION: What is the role of short-sellers in the market, and why are they important for market efficiency?

ANSWER: At times of market exuberance, without meaningful short interest to weigh on valuations, prices can climb quite literally to the moon, thus rendering the end of the cycle even more painful. Short-sellers are thus necessary for healthy market function and historically we have seen that in markets where short selling is either restricted or banned, there are meaningful consequences on the price of securities.

The public broadly has the misconception that short selling is conducted by greed-blind individuals, hiding behind their screens, betting against economic prosperity. However, the vast majority of short-selling volume is largely agnostic, driven by algorithms and technical signals. Short selling allows market participants to access additional leverage and further build their long bets, but also importantly provides a way to hedge portfolios and protect against losses.

There are instances where a company's...

ANSWER: Unfortunately, all arguments leveled against short selling are rooted in human psychology and not in market theory, or logic for that matter. As humans, we are perennially optimistic about our own prospects, and that extends to the prospects of the businesses we invest in. The idea that someone could bet against those prospects feels inherently distasteful. In fact, this idea goes hand-in-hand with the susceptibility of the vast majority of us to be defrauded. Human progress has largely been reliant on faith in our fellow man, so I make no complaints about these qualities. However, the consequence is that most struggle to find the capacity to understand short selling, particularly in times of crisis. Company executives looking to place blame and shift accountability can cry and suggest market manipulation rather than admit to their own mistakes. Politicians too, can point to short-sellers, and even restrict short selling when markets fall, as that would be easier than remedying their own policy-making failures.

QUESTIONS

Worked Examples accompany every important concept using a step-by-step procedure that guides students through the solution process. Clear labels make them easy to find for help with homework and studying.

Applications that Reflect Real Practice

Corporate Finance features actual companies and leaders in the field.

Interviews with notable practitioners—four new for this edition—highlighting leaders in the field and addressing topical subjects.

General Interest boxes highlight timely material from financial publications that shed light on business problems and real-company practices.

Teaching Students to Think Finance

With a consistency in presentation and an innovative set of learning aids that have set the standard since the very first edition, *Corporate Finance* simultaneously meets the needs of both future financial managers and non-financial managers. This textbook truly shows every student how to “think finance.”

Simplified Presentation of Mathematics

One of the hardest parts of learning finance is mastering the jargon, math, and non-standardized notation. *Corporate Finance* systematically uses:

Notation Boxes: Each chapter opens by defining the variables and acronyms used in the chapter as a “legend” for students’ reference.

Timelines: Introduced in Chapter 4, timelines are emphasized as the important first step in solving *every* problem that involves cash flows.

Numbered and Labeled Equations: The first time a full equation is given in notation form it is numbered. Key equations are titled and revisited in the chapter summary.

Using Excel Boxes: Provide hands-on instruction of Excel techniques and include screenshots to serve as a guide for students.

Spreadsheet Tables: Select tables are available as Excel files, enabling students to change inputs and manipulate the underlying calculations.

USING EXCEL Excel’s IRR Function

Excel also has a built-in function, IRR, that will calculate the IRR of a stream of cash flows. Excel’s IRR function has the format, IRR (values, guess), where “values” is the range containing the cash flows, and “guess” is an optional starting guess where Excel begins its search for an IRR. See the example below:

	A	B	C	D	E
1	Period	0	1	2	3
2	Cash Flow C_t	(1,000.0)	300.0	400.0	500.0
3	IRR	8.9% =IRR(B2:E2)			

There are three things to note about the IRR function. First, the values given to the IRR function should include all of the cash flows of the project, including the one at date 0. In this sense, the IRR and NPV functions in Excel are inconsistent. Second, like the NPV function, the IRR ignores the period associated with any blank cells. Finally, as we will discuss in Chapter 7, in some settings the IRR function may fail to find a solution, or may give a different answer, depending on the initial guess.

See the e-Textbook or MyLab Finance for an interactive IRR calculator.

TABLE 8.1 SPREADSHEET

HomeNet’s Incremental Earnings Forecast

	Year	0	1	2	3	4	5
Incremental Earnings Forecast (\$000s)							
1	Sales	—	26,000	26,000	26,000	26,000	—
2	Cost of Goods Sold	—	(11,000)	(11,000)	(11,000)	(11,000)	—
3	Gross Profit	—	15,000	15,000	15,000	15,000	—
4	Selling, General, and Administrative	—	(2,800)	(2,800)	(2,800)	(2,800)	—
5	Research and Development	(15,000)	—	—	—	—	—
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	EBIT	(15,000)	10,700	10,700	10,700	10,700	(1,500)
8	Income Tax at 20%	3,000	(2,140)	(2,140)	(2,140)	(2,140)	300
9	Unlevered Net Income	(12,000)	8,560	8,560	8,560	8,560	(1,200)

Practice Finance to Learn Finance

Working problems is the proven way to cement and demonstrate an understanding of finance.

Concept Check questions at the end of each section enable students to test their understanding and target areas in which they need further review.

End-of-chapter problems written personally by Jonathan Berk and Peter DeMarzo offer instructors the opportunity to assign first-rate materials to students for homework and practice with the confidence that the problems are consistent with chapter content. Both the problems and solutions, which also were written by the authors, have been class-tested and accuracy-checked to ensure quality.

Data Cases present in-depth scenarios in a business setting with questions designed to guide students’ analysis. Many questions involve the use of Internet resources and Excel techniques.

Data Case

This is your second interview with a prestigious brokerage firm for a job as an equity analyst. You survived the morning interviews with the department manager and the Vice President of Equity. Everything has gone so well that they want to test your ability as an analyst. You are seated in a room with a computer and a list with the names of two companies—Ford (F) and Microsoft (MSFT). You have 90 minutes to complete the following tasks:

1. Download each company’s annual income statements, balance sheets, and cash flow statements for the last four fiscal years and export the statements to Excel.
2. Find historical stock prices for each firm for the dates of each financial statement. Use the closing stock prices (not the adjusted close). To calculate the firm’s market capitalization at each date, multiply the number of shares outstanding at the time by the firm’s historic stock price.
3. For each of the four years of statements, compute the following ratios for each firm:

Valuation Ratios

Price-Earnings Ratio (for EPS use Diluted EPS Total)

Market-to-Book Ratio

Enterprise Value-to-EBITDA

(For debt, include long-term and short-term debt; for cash, include marketable securities.)

Profitability Ratios

Operating Margin

Net Profit Margin

Return on Equity

Financial Strength Ratios

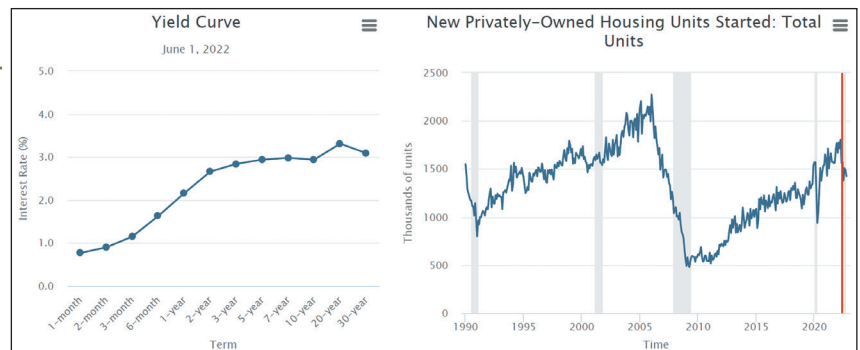
Current Ratio

Engaging with Concepts and Data

Available in both the Sixth Edition eTextbook and MyLab Finance, interactive graphs and tools offer exploration of the current and historical yield curve (and how it moves in relation to other macro data), analysis of common financial statement data and valuation metrics across firms and industries, a compound interest calculator, use of an annuity calculator with an amortization table, a Modigliani and Miller WACC tool, and an efficient frontier portfolio explorer. Instructors also can link to these tools with pre-populated default values for efficient use in the classroom.

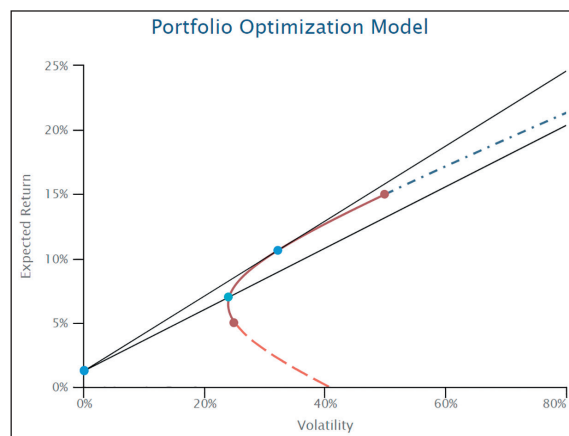
Yield Curve Tool

See the history of the U.S. yield curve (back to 1990) and animate its evolution along with important macroeconomic data including GDP growth, inflation, housing starts, home prices, corporate investment, bond spreads, and the S&P 500 index.



Annuity Calculator

An interactive annuity calculator allows students to solve standard time value of money problems and track the corresponding account balance over time. Students can also toggle to see the discounted cash flow solution and the corresponding Excel formula. (See further description in box on page 161 in Chapter 4.)

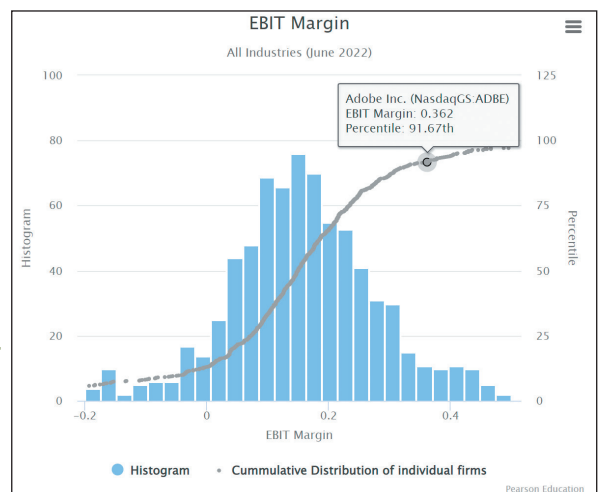


Portfolio Optimizer

The portfolio optimizer tool allows students to explore two-stock portfolios including short-sales and risk-free borrowing and lending, providing an interactive visualization of the two-fund separation that is the foundation for understanding risk and return.

Corporate Data Analysis

The data analysis tool illustrates the current distribution of standard accounting margins and ratios, as well as key leverage and valuation measures, for U.S. stocks by size and industry.



About the Authors

Jonathan Berk is the A.P. Giannini Professor of Finance at the Graduate School of Business, Stanford University and is a Research Associate at the National Bureau of Economic Research. Before coming to Stanford, he was the Sylvan Coleman Professor of Finance at Haas School of Business at the University of California, Berkeley. Prior to earning his Ph.D., he worked as an Associate at Goldman Sachs (where his education in finance really began).

Professor Berk's research interests in finance include corporate valuation, capital structure, mutual funds, asset pricing, experimental economics, and labor economics. His work has won a number of research awards including the Stephen A. Ross Prize in Financial Economics, TIAA-CREF Paul A. Samuelson Award, the Smith Breeden Prize, Best Paper of the Year in *The Review of Financial Studies*, and the FAME Research Prize. His paper, "A Critique of Size-Related Anomalies," was selected as one of the two best papers ever published in *The Review of Financial Studies*. In recognition of his influence on the practice of finance he has received

the Bernstein-Fabozzi/Jacobs Levy Award, the Graham and Dodd Award of Excellence, and the Roger F. Murray Prize. He served two terms as an Associate Editor of the *Journal of Finance*, and a term as a director of the American Finance Association, the Western Finance Association, and academic director of the Financial Management Association. He is a Fellow of the Financial Management Association and a member of the advisory board of the *Journal of Portfolio Management*.

Born in Johannesburg, South Africa, Professor Berk has two daughters, and is an avid skier and biker.

Peter DeMarzo is the John G. McDonald Professor of Finance at the Graduate School of Business, Stanford University, and Faculty Director of Stanford LEAD. He is the former President of the American Finance Association and a Research Associate at the National Bureau of

Economic Research. He teaches MBA and Ph.D. courses in Corporate Finance and Financial Modeling. Professor DeMarzo has also taught at the Haas School of Business and the Kellogg Graduate School of Management. He is a Fellow of the Econometric Society, the American Finance Association, and former National Fellow at the Hoover Institution.

Professor DeMarzo received the Sloan Teaching Excellence Award at Stanford and the Earl F. Cheit Outstanding Teaching Award at U.C. Berkeley. Professor DeMarzo has served as an Associate Editor for *The Review of Financial Studies* and *Financial Management*, as well as Vice President and director of the American Finance Association and President of the Western Finance Association. Professor DeMarzo's research is in the area of corporate finance, asset securitization, and contracting, as well as market structure and regulation. His recent work has examined issues of the optimal design of contracts and securities, leverage dynamics and the role of bank capital regulation, and the influence of information asymmetries on stock prices and corporate investment. He has received numerous awards including the Western Finance Association Corporate Finance Best-Paper Award, the Charles River Associates Best-Paper Award, the Barclays Global Investors/Michael Brennan Best-Paper of the Year Award from *The Review of Financial Studies*, and the Brattle Prize for the best corporate finance paper from the *Journal of Finance*.

Professor DeMarzo was born in Whitestone, New York. He and his family enjoy hiking, biking, and skiing.



Peter DeMarzo and Jonathan Berk shortly before the first edition was published.

Preface

THE WORLD HAS CHANGED DRAMATICALLY since we first sat down together and conceived of this book. We have now published 6 editions and reached millions of students worldwide. We were originally motivated to write this textbook by a central insight: The core concepts in finance are simple and intuitive. What makes the subject challenging is that it is often difficult for a novice to distinguish between these core ideas and other intuitively appealing approaches that, if used in financial decision making, will lead to incorrect decisions. In this regard, nothing has changed in the intervening years. De-emphasizing the core concepts that underlie finance strips students of the essential intellectual tools they need to differentiate between good and bad decision making. The book's continued success is a testament to the value of this approach.

We present corporate finance as an application of a set of simple, powerful ideas. At the heart is the principal of the absence of arbitrage opportunities, or Law of One Price—*in life, you don't get something for nothing*. This simple concept is a powerful and important tool in financial decision making. By relying on it, and the other core principles in this book, financial decision makers can avoid the bad decisions brought to light by the financial crisis and still ongoing every day. We use the Law of One Price as a compass; it keeps financial decision makers on the right track and is the backbone of the entire book.

New to This Edition

We have updated all text discussions and figures, tables, data cases, and facts to accurately reflect developments in the field in the last few years. Specific highlights include the following:

- Broadened the Global Financial Crisis boxes to be about Finance in Times of Disruption and included discussion of the COVID-19 pandemic.
- Developed interactive graphs and tools for the eTextbook, including an interactive exploration of the historical yield curve, a tool to analyze common financial statement data and ratios across firms and industries, an annuity calculator with an amortization table, a Modigliani and Miller WACC tool, and an efficient frontier portfolio explorer.
- Enhanced discussion of stakeholder and ESG concerns in Chapter 1 to put them in the context of the shareholder value maximization goal.
- Updated discussion of accounting scandals (Chapter 2) and cryptocurrency and stock price bubbles (Chapter 9).
- Added a new section on SPACs in Chapter 23 as an alternative to IPOs.
- Updated the coverage of leasing to reflect accounting treatment changes in Chapter 25 on Leasing.
- Updated and added new interviews: Fahmi Quadi on the role of short sellers, Adena Friedman on the ongoing evolution of stock exchanges, Kenneth Frazier on real options analysis at Merck, and Sally Johnson on managing international risk.
- Incorporated new and/or revised features throughout, including Common Mistakes, Finance in Times of Disruption, Nobel Prize, and General Interest boxes, as well as Examples.
- Revised and redesigned the data cases so that they will be more robust to changes in available data sources. Revised problems, once again personally writing and solving each one.
- Updated tables and figures to reflect current data.

The Law of One Price as a Unifying Principle of Valuation

This book presents corporate finance as an application of a small set of simple core ideas. Modern finance theory and practice is grounded in the idea of the absence of arbitrage—or the Law of One Price—as the unifying concept in valuation. We introduce the Law of One Price concept as the basis for NPV and the time value of money in Chapter 3, Financial Decision Making and the Law of One Price. In the opening of each part and as pertinent throughout the remaining chapters, we relate major concepts to the Law of One Price, creating a framework to ground the student reader and connect theory to practice.

Table of Contents Overview

Corporate Finance offers coverage of the major topical areas for introductory-level MBA students as well as the depth required in a reference textbook for upper-division courses. Most professors customize their classes by selecting a subset of chapters reflecting the subject matter they consider most important. We designed this book from the outset with this need for flexibility in mind. Parts 2 through 6 are the core chapters in the book. We envision that most MBA programs will cover this material—yet even within these core chapters instructors can pick and choose.

Single quarter course: Cover Chapters 3–15; if time allows, or students are previously familiar with the time value of money, add on Chapters 16–19.

Semester-long course: Incorporate options (Chapters 20–22) and Part 10, *Special Topics*, chapters as desired.

Single mini-semester: Assign Chapters 3–10, 14, and 15 if time allows.

Chapter	Highlights and Changes
1 The Corporation and Financial Markets	Introduces the corporation and its governance, financial markets, and financial intermediation; updated discussion of ESG and stakeholder considerations in the context of shareholder value maximization; new interview with Nasdaq CEO Adena Friedman.
2 Introduction to Financial Statement Analysis	Introduces key financial statements; coverage of financial ratios is centralized to prepare students to analyze financial statements holistically. The eTextbook includes an interactive data analyzer for common financial statement information and ratios. Updated discussion of financial scandals.
3 Financial Decision Making and the Law of One Price	Introduces the Law of One Price and net present value as the basis of the book’s unifying framework.
4 The Time Value of Money	Introduces the mechanics of discounting with applications to personal finance; Using Excel boxes familiarizes students with spreadsheet functionality. The eTextbook includes extensive use of the new interactive annuity calculator.
5 Interest Rates	Discusses key determinants of interest rates and their relation to the cost of capital; Interview with Janet L. Yellen, current U.S. Treasury Secretary and former Chair of the Board of Governors of the Federal Reserve System.
6 Valuing Bonds	Analyzes bond prices and yields, as well as the risk of fixed-income securities as illustrated by the sovereign debt crisis and the COVID-19 pandemic; expanded Finance in Times of Disruption box on negative bond yields; Data Case on corporate yield curves and case study on sovereign default.
7 Investment Decision Rules	Introduces the NPV rule as the “golden rule” against which we evaluate other investment decision rules; introduces the use of Data Tables for sensitivity analysis.

Chapter	Highlights and Changes
8 Fundamentals of Capital Budgeting	Provides a clear focus on the distinction between earnings and free cash flow, and shows how to build a financial model to assess the NPV of an investment decision (including tips on using Excel); Common Mistake box on corporate tax rates and investment; updates to align with corporate tax changes.
9 Valuing Stocks	Provides a unifying treatment of projects within the firm and the valuation of the firm as a whole; updated box on cryptocurrencies and financial bubbles; new interview with Fahmi Quadir on the role of short sellers.
10 Capital Markets and the Pricing of Risk	Establishes the intuition for understanding risk and return, explains the distinction between diversifiable and systematic risk, and introduces beta and the CAPM; extensive data updates throughout to reflect current market conditions.
11 Optimal Portfolio Choice and the Capital Asset Pricing Model	Presents the CAPM and develops the details of mean-variance portfolio optimization; interview with Anne Martin, Wesleyan University Chief Investment Officer; updated examples and Data Case.
12 Estimating the Cost of Capital	Demonstrates the practical details of estimating the cost of capital for equity, debt, or a project, and introduces asset betas, and the unlevered and weighted-average cost of capital; Using Excel box on estimating beta.
13 Investor Behavior and Capital Market Efficiency	Examines the role of behavioral finance and ties investor behavior to the topic of market efficiency and alternative models of risk and return; expanded discussion of fund manager performance; Nobel Prize box on Behavioral Finance; discussion of “Smart Beta”.
14 Capital Structure in a Perfect Market	Presents Modigliani and Miller’s results and introduces the market value balance sheet, discussion of important leverage fallacies with application to bank capital regulation.
15 Debt and Taxes	Analyzes the tax benefits of leverage, including the debt tax shield and the after-tax WACC; Common Mistake box on retirement investing; updates to align with corporate tax changes.
16 Financial Distress, Managerial Incentives, and Information	Examines the role of asymmetric information and introduces agency costs including debt overhang and leverage ratchet effects; Nobel Prize boxes on asymmetric information and adverse selection, and bank runs and default.
17 Payout Policy	Considers alternative payout policies including dividends and share repurchases; analyzes the role of market imperfections in determining the firm’s payout policy; updated discussion of corporate cash retention.
18 Capital Budgeting and Valuation with Leverage	Develops in depth the three main methods for capital budgeting with leverage and market imperfections: the weighted average cost of capital (WACC) method, the adjusted present value (APV) method, and the flow-to-equity (FTE) method; appendix explains the relation between DCF and residual income valuation methods.
19 Valuation and Financial Modeling: A Case Study	Builds a financial model for a leveraged acquisition; Using Excel box “Summarizing Model Outputs”.
20 Financial Options	Introduces the concept of financial options, how they are used and exercised; demonstrates how corporate securities may be interpreted using options.
21 Option Valuation	Develops the binomial, Black-Scholes, and risk-neutral pricing methods for option pricing.
22 Real Options	Analyzes real options using decision tree and Black-Scholes methods, and considers the optimal staging of investment; discussion of decision tree methodology with examples; new interview with Kenneth Frazier on real options in drug development at Merck.
23 Raising Equity Capital	Overview of the stages of equity financing, from angel financing and venture capital to IPO to seasoned equity offerings; venture capital financing including common deal terms and protections as well as an illustration of typical funding patterns and success rates; new section on SPACs with examples.

Chapter	Highlights and Changes
24 Debt Financing	Overview of debt financing, including a discussion of asset-backed securities and their role in the financial crisis.
25 Leasing	Introduces leasing as an alternative form of levered financing; update on new FASB rules for lease accounting; new examples and discussion of potential benefits of leasing.
26 Working Capital Management	Introduces the Cash Conversion Cycle and methods for managing working capital; new Finance in Times of Disruption box on supply chain disruptions during COVID-19.
27 Short-Term Financial Planning	Develops methods for forecasting and managing short-term cash needs.
28 Mergers and Acquisitions	Considers motives and methods for mergers and acquisitions, including leveraged buyouts; expanded discussion of valuation and premiums paid.
29 Corporate Governance	Evaluates direct monitoring, compensation policies, and regulation as methods to manage agency conflicts within the firm; addresses impact of Dodd-Frank Act; discussion of shareholder activism and its recent impact on corporate governance; Common Mistake box on celebrity boards.
30 Risk Management	Analyzes the methods and motives for the use of insurance, commodity futures, currency forwards and options, and interest rate swaps to hedge risk.
31 International Corporate Finance	Analyzes the valuation of projects with foreign currency cash flows with integrated or segregated capital markets; updates to align with corporate tax changes; new interview with Sally Johnson on managing international risks.

Acknowledgments

With six editions now behind us, we are heartened by the book's success and its impact on the profession by shaping future practitioners. As any textbook writer will tell you, achieving this level of success requires a substantial amount of help. First and foremost we thank Donna Battista, whose leadership, talent, and market savvy are imprinted on all aspects of the project and are central to its more than 14 years of success; Denise Clinton, a friend and a leader in fact not just in name, whose experience and knowledge were indispensable in the earliest stages; Rebecca Ferris-Caruso, for her unparalleled expertise in managing the complex writing, reviewing, and editing processes and patience in keeping us on track—it is impossible to imagine writing the first edition without her; Jami Minard, for spearheading marketing efforts; Emily Biberger, for her energy and fresh perspective as our editor; Miguel Leonarte, for his central role on MyLab Finance; and Tristann Jones for getting the book from draft pages into print. We were blessed to be approached by the best publisher in the business and we are both truly thankful for the indispensable help provided by these and other professionals, including Meredith Gertz, Melissa Honig, Noel Lotz, and Latoya Douse.

Updating a textbook like ours requires a lot of painstaking work, and there are many who have provided insights and input along the way. We would especially like to call out Jared Stanfield for his important contributions and suggestions throughout. We're also appreciative of Marlene Bellamy's work conducting the lively interviews that provide a critically important perspective, and to the interviewees who graciously provided their time and insights.

Of course, this sixth edition text is built upon the shoulders of the first five, and we have many to thank for helping us make those early versions a reality. We remain forever grateful for Jennifer Koski's critical insights, belief in this project, and tireless effort, all of which were critical to the first edition. Many of the later, non-core chapters required specific detailed knowledge. Nigel Barradale, Reid Click, Jarrad Harford, and Marianne Plunkert ensured that this knowledge was effectively communicated. Joseph Vu and Vance P. Lesseig contributed their talents to the Concept Check questions and Data Cases, respectively.

Creating a truly error-free text is a challenge we could not have lived up to without our team of expert error checkers; we owe particular thanks to Sukarnen Suwanto, Siddharth Bellur, Robert James, Anand Goel, Ian Drummond Gow, Janet Payne, Mike Casey, and Jared Stanfield. Thomas Gilbert and Miguel Palacios tirelessly worked examples and problems in the first edition, while providing numerous insights along the way.

A corporate finance textbook is the product of the talents and hard work of many talented colleagues. We are especially gratified with the work of those who updated the impressive array of supplements to accompany the book: Janet Payne for the Instructor's Manual; William Chittenden for the PowerPoint; and Michael Woodworth for the Test Bank.

As a colleague of both of us, Mark Rubinstein inspired us with his passion to get the history of finance right by correctly attributing the important ideas to the people who first enunciated them. We have used his book, *A History of the Theory of Investments: My Annotated Bibliography*, extensively in this text and we, as well as the profession as a whole, owe him a debt of gratitude for taking the time to write it all down.

We could not have written this text if we were not once ourselves students of finance. As any student knows, the key to success is having a great teacher. In our case we are lucky to have been taught and advised by the people who helped create modern finance: Ken Arrow, Darrell Duffie, Mordecai Kurz, Stephen Ross, and Richard Roll. It was from them that we learned the importance of the core principles of finance, including the Law of One Price, on which this book is based. The learning process does not end at graduation and like most people we have had especially influential colleagues and mentors from which we learned a great deal during our careers and we would like to recognize them explicitly here: Mike Fishman, Richard Green, Vasant Naik, Art Raviv, Mark Rubinstein, Joe Williams, and Jeff Zwiebel. We continue to learn from all of our colleagues and we are grateful to all of them. Finally, we would like to thank those with whom we have taught finance classes over the years: Anat Admati, Ming Huang, Dirk Jenter, Robert Korajczyk, Paul Pfleiderer, Sergio Rebelo, Richard Stanton, and Raman Uppal. Their ideas and teaching strategies have without a doubt influenced our own sense of pedagogy and found their way into this text.

Finally, and most importantly, we owe our biggest debt of gratitude to Rebecca Schwartz and Kauai Chun DeMarzo. Little did we (or they) know how much this project would impact our lives, and without their love and support—and especially their patience and understanding—this text could not have been completed. We owe a special thanks to Kauai DeMarzo, for her inspiration and support at the start of this project, and for her willingness to be our in-house editor, contributor, advisor, and overall sounding-board throughout each stage of its development.

Jonathan Berk
Peter DeMarzo

Contributors

We are truly thankful to have had so many manuscript reviewers, class testers, and focus group participants. We list all of these contributors below, but Gordon Bodnar, James Conover, Anand Goel, James Linck, Evgeny Lyandres, Marianne Plunkert, Mark Simonson, and Andy Terry went so far beyond the call of duty that we would like to single them out.

We are very grateful for all comments—both informal and in written evaluations—from Sixth Edition users. We carefully weighed each reviewer suggestion as we sought to streamline the narrative to improve clarity and add relevant new material. The book has benefited enormously for this input.

Reviewers

Ashok B. Abbott, *West Virginia University*
 Michael Adams, *Jacksonville University*
 Ilan Adler, *University of California, Berkeley*
 Ibrahim Affaneh, *Indiana University of Pennsylvania*
 Kevin Ahlgrim, *Illinois State University*
 Andres Almazan, *University of Texas, Austin*
 Confidence Amadi, *Florida A&M University*
 Christopher Anderson, *University of Kansas*
 Tom Arnold, *University of Richmond*
 John Banko, *University of Florida*
 Nigel Barradale, *Copenhagen Business School*
 Peter Basciano, *Augusta State University*
 Thomas Bates, *University of Arizona*
 Paul Bayes, *East Tennessee State University*
 Omar Benkato, *Ball State University*
 Gordon Bodnar, *Johns Hopkins University*
 Stephen Borde, *University of Central Florida*
 Waldo Born, *Eastern Illinois University*
 Alex Boulatov, *Higher School of Economics, Moscow*
 Chen Cai, *Cleveland State University*
 Tyrone Callahan, *University of Southern California*
 David Carter, *Oklahoma State University*
 Yingpin (George) Chang, *Grand Valley State University*
 Engku Ngah S. Engku Chik, *University Utara Malaysia*
 William G. Christie, *Vanderbilt University*
 Ting-Heng Chu, *East Tennessee State University*
 John H. Cochrane, *Stanford University*
 James Conover, *University of North Texas*
 James Cordeiro, *SUNY Brockport*
 Henrik Cronqvist, *Claremont McKenna College*
 Maddur Daggur, *Citigroup*
 Hazem Daouk, *Cornell University*
 Sougata Das, *Montana State University Billings*
 Theodore Day, *University of Texas at Dallas*
 Daniel Deli, *DePaul University*
 Andrea DeMaskey, *Villanova University*
 David Dicks, *Baylor University*
 B. Espen Eckbo, *Dartmouth College*
 Larry Eisenberg, *University of Southern Mississippi*
 Riza Emekter, *Robert Morris University*
 Gayle Erwin, *University of Virginia*
 T. Hanan Eytan, *Baruch College*
 Andre Farber, *Universite Libre de Bruxelles*
 Stephen Ferris, *University of Missouri—Columbia*
 Eliezer Fich, *Drexel University*
 Michael Fishman, *Northwestern University*
 Fangjian Fu, *Singapore Management University*
 Vito Gala, *Wharton School of the University of Pennsylvania*

Michael Gallmeyer, *University of Virginia*
 Amar Gande, *Southern Methodist University*
 Diego Garcia, *University of Colorado*
 Tom Geurts, *Marist College*
 Frank Ghannadian, *University of Tampa*
 Thomas Gilbert, *University of Washington*
 Anand Goel, *Stevens Institute of Technology*
 Marc Goergen, *Cardiff Business School*
 David Goldenberg, *Rensselaer Polytechnic Institute*
 Qing (Grace) Hao, *University of Missouri*
 Milton Harris, *University of Chicago*
 Christopher Hennessy, *London Business School*
 J. Ronald Hoffmeister, *Arizona State University*
 Vanessa Holmes, *Xavier University*
 Ruidi Huang, *Southern Methodist University*
 Wenli Huang, *Boston University School of Management*
 Mark Hutchinson, *University College Cork*
 Michael Hutchinson, *Wilmington University*
 Stuart Hyde, *University of Manchester*
 Ronen Israel, *IDC*
 Robert James, *Boston College*
 Keith Johnson, *University of Kentucky*
 Jouko Karjalainen, *Helsinki University of Technology*
 Ayla Kayhan, *Louisiana State University*
 Doseong Kim, *University of Akron*
 Kenneth Kim, *State University of New York—Buffalo*
 Elinda Kiss, *University of Maryland*
 Halil Kiymaz, *Rollins College*
 Brian Kluger, *University of Cincinnati*
 John Knopf, *University of Connecticut*
 C.N.V. Krishnan, *Case Western Reserve University*
 George Kutner, *Marquette University*
 Vance P. Lesseig, *Texas State University*
 Martin Lettau, *University of California, Berkeley*
 Michel G. Levasseur, *Esa Universite de Lille 2*
 Jose Liberti, *Northwestern University*
 Wendell Licon, *Arizona State University*
 James Linck, *Southern Methodist University*
 David Lins, *University of Illinois at Urbana-Champaign*
 Lan Liu, *California State University, Sacramento*
 Michelle Lowry, *Drexel University*
 Deborah Lucas, *Massachusetts Institute of Technology*
 Peng (Peter) Liu, *Cornell University*
 Evgeny Lyandres, *Tel Aviv University*
 Balasundram Maniam, *Sam Houston State University*
 Suren Mansinghka, *University of California, Irvine*
 Daniel McConaughy, *California State University, Northridge*
 Robert McDonald, *Northwestern University*

- Mark McNabb, *University of Cincinnati*
 Ilhan Meric, *Rider University*
 Timothy Michael, *James Madison University*
 Dag Michalsen, *Norwegian School of Management*
 Todd Milbourn, *Washington University in St. Louis*
 James Miles, *Penn State University*
 Darius Miller, *Southern Methodist University*
 Emmanuel Morales-Camargo, *University of New Mexico*
 Helen Moser, *University of Minnesota*
 Arjen Mulder, *Erasmus University*
 Michael Muoghalu, *Pittsburg State University*
 Jeryl Nelson, *Wayne State College*
 Tom Nelson, *University of Colorado*
 Chee Ng, *Fairleigh Dickinson University*
 Ben Nunnally, *University of North Carolina, Charlotte*
 Terrance Odean, *University of California, Berkeley*
 Frank Ohara, *University of San Francisco*
 Marcus Opp, *Stockholm School of Economics*
 Henry Oppenheimer, *University of Rhode Island*
 Miguel Palacios, *University of Calgary*
 Mitchell Petersen, *Northwestern University*
 Marianne Plunkert, *University of Colorado at Denver*
 Paul Povel, *University of Houston*
 Eric A. Powers, *University of South Carolina*
 Michael Provitera, *Barry University*
 Brian Prucyk, *Marquette University*
 Charu Raheja, *TriageLogic Management*
 Latha Ramchand, *University of Houston*
 Adriano Rampini, *Duke University*
 P. Raghavendra Rau, *University of Cambridge*
 S. Abraham Ravid, *Yeshiva University*
 William A. Reese, Jr., *Tulane University*
 Ali Reza, *San Jose State University*
 Steven P. Rich, *Baylor University*
 Antonio Rodriguez, *Texas A&M International University*
 Mauricio Rodriguez, *Texas Christian University*
 Bruce Rubin, *Old Dominion University*
 Mark Rubinstein, *University of California, Berkeley*
 Doriana Ruffino, *University of Minnesota*
 Harley E. Ryan, Jr., *Georgia State University*
 Jacob A. Sagi, *University of North Carolina*
 Jesus Salas, *Lehigh University*
 Harikumar Sankaran, *New Mexico State University*
 Mukunthan Santhanakrishnan, *Southern Methodist University*
 Frederik Schlingemann, *University of Pittsburgh*
 Eduardo Schwartz, *University of California, Los Angeles*
 Mark Seasholes, *Arizona State University*
 Berk Sensoy, *Vanderbilt University*
 Mark Shackleton, *Lancaster University*
 Jay Shanken, *Emory University*
 Dennis Sheehan, *Penn State University*
 Anand Shetty, *Iona College*
 Clemens Sialm, *University of Texas at Austin*
 Mark Simonson, *Arizona State University*
 Rajeev Singhal, *Oakland University*
 Erik Stafford, *Harvard Business School*
 David Stangeland, *University of Manitoba*
 Richard H. Stanton, *University of California, Berkeley*
 Mark Hoven Stohs, *California State University, Fullerton*
 Ryan Stever, *Bank for International Settlements*
 Ilya A. Strebulaev, *Stanford University*
 John Strong, *College of William and Mary*
 Diane Suhler, *Columbia College*
 Lawrence Tai, *Zayed University*
 Thomas Tallerico, *Stony Brook University*
 Mark Taranto, *University of Maryland*
 Amir Tavakkol, *Kansas State University*
 Andy Terry, *University of Arkansas at Little Rock*
 John Thornton, *Kent State University*
 Alex Triantis, *University of Maryland*
 Sorin Tuluca, *Fairleigh Dickinson University*
 P. V. Viswanath, *Pace University*
 Gautam Vora, *University of New Mexico*
 Joseph Vu, *DePaul University*
 Joe Walker, *University of Alabama at Birmingham*
 Edward Waller, *University of Houston, Clear Lake*
 Kainan Wang, *University of Toledo*
 Shelly Webb, *Xavier University*
 Peihwang Wei, *University of New Orleans*
 Peter Went, *Global Association of Risk Professionals (GARP)*
 John White, *Georgia Southern University*
 Lucy White, *Boston University*
 Michael E. Williams, *University of Denver*
 Annie Wong, *Western Connecticut State University*
 K. Matthew Wong, *International School of Management, Paris*
 Bob Wood, Jr., *Tennessee Tech University*
 Lifan (Frank) Wu, *California State University, Los Angeles*
 Tzyy-Jeng Wu, *Pace University*
 Feixue Xie, *University of Texas at El Paso*
 Michal Zator, *University of Notre Dame*
 Jaime Zender, *University of Colorado Boulder*
 Jeffrey H. Zwiebel, *Stanford University*
- ### Chapter Class Testers
- Jack Aber, *Boston University*
 John Adams, *University of South Florida*
 James Conover, *University of North Texas*
 Tom Geurts, *Marist College*

Lou Gingerella, *Rensselaer Polytechnic Institute*
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 Gautum Kaul, *University of Michigan*
 Doseong Kim, *University of Akron*
 Jennifer Koski, *University of Washington*
 George Kutner, *Marquette University*
 Larry Lynch, *Roanoke College*
 Vasil Mihov, *Texas Christian University*
 Jeryl Nelson, *Wayne State College*
 Chee Ng, *Fairleigh Dickinson University*
 Ben Nunnally, *University of North Carolina, Charlotte*
 Michael Provitera, *Barry University*
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 Mark Seasholes, *University of California, Berkeley*
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 Sorin Tuluca, *Fairleigh Dickinson University*
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End-of-Chapter Problems Class Testers

James Angel, *Georgetown University*
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 Robert Kravchuk, *Indiana University*
 George Kutner, *Marquette University*
 James Nelson, *East Carolina University*
 Don Panton, *University of Texas at Arlington*
 P. Raghavendra Rau, *Purdue University*
 Carolyn Reichert, *University of Texas at Dallas*
 Mark Simonson, *Arizona State University*
 Diane Suhler, *Columbia College*

Focus Group Participants

Christopher Anderson, *University of Kansas*
 Chenchu Bathala, *Cleveland State University*
 Matthew T. Billett, *University of Iowa*
 Andrea DeMaskey, *Villanova University*
 Anand Desai, *Kansas State University*
 Ako Doffou, *Sacred Heart University*
 Shannon Donovan, *Bridgewater State University*
 Ibrahim Elsaify, *Goldey-Beacom College*
 Mark Holder, *Kent State University*
 Steve Isberg, *University of Baltimore*
 Arun Khanna, *Butler University*
 Brian Kluger, *University of Cincinnati*
 Greg La Blanc, *University of California, Berkeley*
 Dima Leshchinskii, *Rensselaer Polytechnic University*

James S. Linck, *University of Georgia*
 Larry Lynch, *Roanoke College*
 David C. Mauer, *Southern Methodist University*
 Alfred Mettler, *Georgia State University*
 Stuart Michelson, *Stetson University*
 Vassil Mihov, *Texas Christian University*
 Jeryl Nelson, *Wayne State College*
 Chee Ng, *Fairleigh Dickinson University*
 Ben Nunnally, *University of North Carolina at Charlotte*
 Sunny Onyiri, *Campbellsville University*
 Janet Payne, *Texas State University*
 Michael Provitera, *Barry University*
 S. Abraham Ravid, *Yeshiva University*
 William A. Reese, Jr., *Tulane University*
 Mario Reyes, *University of Idaho*
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 Robert Ritchey, *Texas Tech University*
 Antonio Rodriquez, *Texas A&M International University*
 Dan Rogers, *Portland State University*
 Harley E. Ryan, Jr., *Georgia State University*
 Harikumar Sankaran, *New Mexico State University*
 Sorin Sorescu, *Texas A&M University*
 David Stangeland, *University of Manitoba*
 Jonathan Stewart, *Abilene Christian University*
 Mark Hoven Stohs, *California State University, Fullerton*
 Tim Sullivan, *Bentley College*
 Olie Thorp, *Babson College*
 Harry Turtle, *Washington State University*
 Joseph Vu, *DePaul University*
 Joe Walker, *University of Alabama at Birmingham*
 Jill Wetmore, *Saginaw Valley State University*
 Jack Wolf, *Clemson University*
 Bob Wood, Jr., *Tennessee Tech University*
 Donald H. Wort, *California State University, East Bay*
 Scott Wright, *Ohio University*
 Tong Yao, *University of Arizona*

MyLab Finance Contributors

Carlos Bazan, *San Diego State University*
 Ting-Heng Chu, *East Tennessee State University*
 Shannon Donovan, *Bridgewater State College*
 Michael Woodworth

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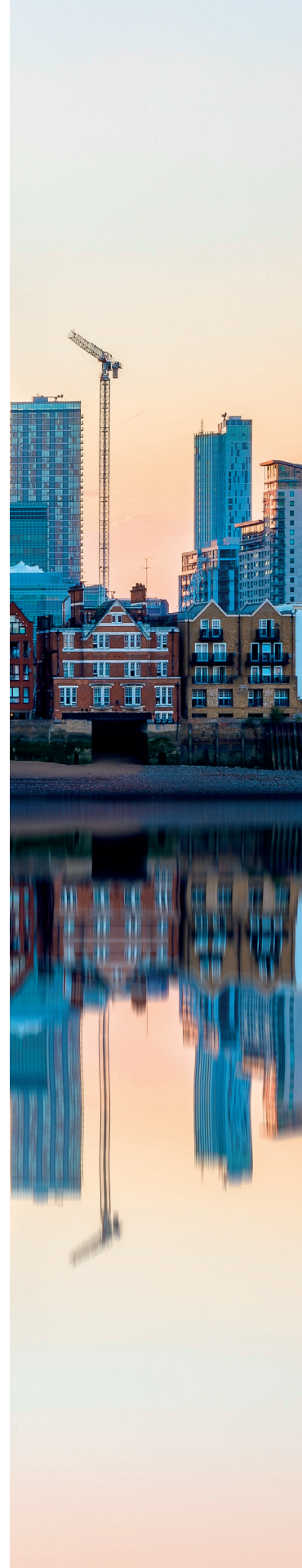
Reviewers

Ann-Ngoc Nguyen, *Middlesex University*
 Ismail Ufuk Gucbilmez, *University of Glasgow*
 Huong Vu, *University of Aberdeen*

CORPORATE FINANCE

SIXTH EDITION

GLOBAL EDITION



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Introduction

WHY STUDY CORPORATE FINANCE? No matter what your role in a corporation, an understanding of why and how financial decisions are made is essential. Even the best and most innovative business ideas require an investment of resources. The tools of finance allow you to assess whether that investment is worthwhile, how it might be improved, and how it might be funded. And while the main focus of this book is how to make optimal corporate financial decisions, along the way you will learn skills that will guide you in your personal financial decisions as well.

In this part of the book, we lay the foundation for our study of corporate finance. We begin, in Chapter 1, by introducing the corporation and related business forms. We then examine the role of financial managers and outside investors in decision making for the firm. To make optimal decisions, a decision maker needs information. As a result, in Chapter 2, we review an important source of information for corporate decision-making—the firm’s financial statements.

We then introduce the most important idea in this book, the concept of *the absence of arbitrage* or *Law of One Price* in Chapter 3. The Law of One Price allows us to use market prices to determine the value of an investment opportunity to the firm. We will demonstrate that the Law of One Price is the one unifying principle that underlies all of financial economics and links all of the ideas throughout this book. We will return to this theme throughout our study of Corporate Finance.

CHAPTER 1
The Corporation and Financial Markets

CHAPTER 2
Introduction to Financial Statement Analysis

CHAPTER 3
Financial Decision Making and the Law of One Price

The Corporation and Financial Markets

THE MODERN U.S. CORPORATION WAS BORN IN A COURTROOM

in Washington, D.C., on February 2, 1819. On that day the U.S. Supreme Court established the legal precedent that the property of a corporation, like that of a person, is private and entitled to protection under the U.S. Constitution. Today, it is hard to entertain the possibility that a corporation's private property would not be protected under the Constitution. However, before the 1819 Supreme Court decision, the owners of a corporation were exposed to the possibility that the state could take their business. This concern was real enough to stop most businesses from incorporating and, indeed, in 1816 that concern was realized: The state seized Dartmouth College.

Dartmouth College was incorporated in 1769 as a private educational institution governed by a self-perpetuating board of trustees. Unhappy with the political leanings of the board, the state legislature effectively took control of Dartmouth by passing legislation in 1816 that established a governor-appointed board of overseers to run the school. The legislation had the effect of turning a private university under private control into a state university under state control. If such an act were constitutional, it implied that any state (or the federal government) could, at will, nationalize any corporation.

Dartmouth sued for its independence and the case made it to the Supreme Court under Chief Justice John Marshall in 1818. In a nearly unanimous 5–1 decision, the court struck down the New Hampshire law, ruling that a corporation was a “contract” and that, under Article 1 of the Constitution, “the state legislatures were forbidden to pass any law impairing the obligation of contracts.”¹ The precedent was set: Owners of businesses could incorporate and still enjoy the protection of private property, as well as protection from seizure, both guaranteed by the U.S. Constitution. The modern business corporation was born.

¹ The full text of John Marshall's decision can be found at <https://caselaw.findlaw.com/us-supreme-court/17/518.html>.

Today, the corporate structure is ubiquitous all over the world, and continues to evolve in the face of new forces. For example, in 2008, the financial crisis transformed the financial landscape, bringing down giants like Bear Stearns, Lehman Brothers, and AIG and reshaping investment banks like Goldman Sachs into government-guaranteed commercial banks. Government bailouts of institutions such as General Motors and AIG have provoked challenging questions regarding the role of the federal government in the control and management of private corporations. In the wake of that crisis, significant reforms of the regulation and oversight of financial markets were passed into law. And though the crisis has now passed, new political agendas and global tensions continue to reshape the practice of business, so that understanding the principles of corporate finance remains as important as ever.

The focus of this book is on how people in corporations make financial decisions. This chapter introduces the corporation and explains alternative business organizational forms. A key factor in the success of corporations is the ability to easily trade ownership shares, and so we will also explain the role of stock markets in facilitating trading among investors in a corporation and the implications that has for the ownership and control of corporations.

1.1 The Four Types of Firms

We begin our study of corporate finance by introducing the four major types of firms: *sole proprietorships*, *partnerships*, *limited liability companies*, and *corporations*. We explain each organizational form in turn, but our primary focus is on the most important form—the corporation. In addition to describing what a corporation is, we also provide an overview of why corporations are so successful.

Sole Proprietorships

A **sole proprietorship** is a business owned and run by one person. Sole proprietorships are usually very small with few, if any, employees. Although they do not account for much sales revenue in the economy, they are the most common type of firm in the world, as shown in Figure 1.1. Statistics indicate that nearly 72% of businesses in the United States are sole proprietorships, although they generate only 4% of the revenue. Contrast this with corporations, which make up under 18% of firms but are responsible for 82% of U.S. revenue.

Sole proprietorships share the following key characteristics:

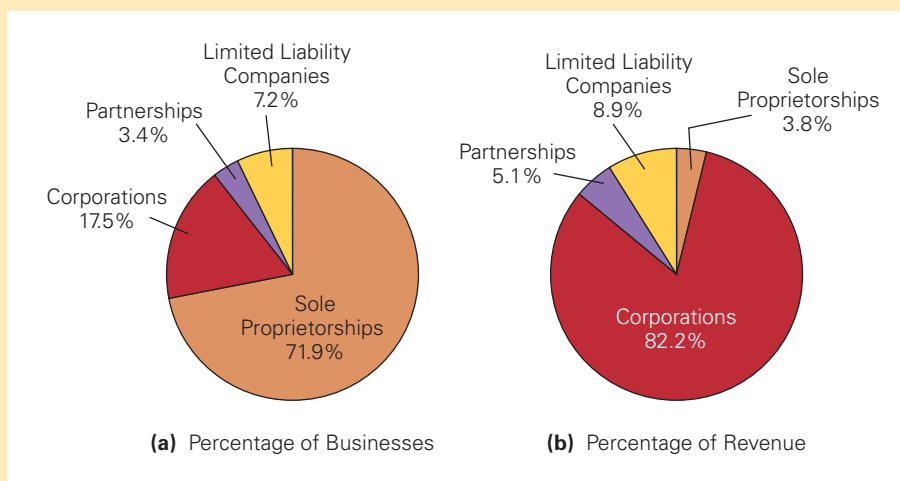
1. Sole proprietorships are straightforward to set up. Consequently, many new businesses use this organizational form.
2. The principal limitation of a sole proprietorship is that there is no separation between the firm and the owner—the firm can have only one owner. If there are other investors, they cannot hold an ownership stake in the firm.
3. The owner has unlimited personal liability for any of the firm's debts. That is, if the firm defaults on any debt payment, the lender can (and will) require the owner to repay the loan from personal assets. An owner who cannot afford to repay the loan must declare personal bankruptcy.
4. The life of a sole proprietorship is limited to the life of the owner. It is also difficult to transfer ownership of a sole proprietorship.

FIGURE 1.1

Types of U.S. Firms

There are four different types of firms in the United States. As (a) and (b) show, although the majority of U.S. firms are sole proprietorships, they generate only a small fraction of total revenue, in contrast to corporations.

Source: www.irs.gov



For most businesses, the disadvantages of a sole proprietorship outweigh the advantages. As soon as the firm reaches the point at which it can borrow without the owner agreeing to be personally liable, the owners typically convert the business into a form that limits the owner's liability.

Partnerships

A **partnership** is identical to a sole proprietorship except it has more than one owner. The following are key features of a partnership:

1. *All* partners are liable for the firm's debt. That is, a lender can require *any* partner to repay all the firm's outstanding debts.
2. The partnership ends on the death or withdrawal of any single partner, although partners can avoid liquidation if the partnership agreement provides for alternatives such as a buyout of a deceased or withdrawn partner.

Some old and established businesses remain partnerships or sole proprietorships. Often these firms are the types of businesses in which the owners' personal reputations are the basis for the businesses. For example, law firms, groups of doctors, and accounting firms are often organized as partnerships. For such enterprises, the partners' personal liability increases the confidence of the firm's clients that the partners will strive to maintain their reputation.

A **limited partnership** is a partnership with two kinds of owners, general partners and limited partners. General partners have the same rights and privileges as partners in a (general) partnership—they are personally liable for the firm's debt obligations. Limited partners, however, have **limited liability**—that is, their liability is limited to their investment. Their private property cannot be seized to pay off the firm's outstanding debts. Furthermore, the death or withdrawal of a limited partner does not dissolve the partnership, and a limited partner's interest is transferable. However, a limited partner has no management authority and cannot legally be involved in the managerial decision making for the business.

Private equity funds and venture capital funds are two examples of industries dominated by limited partnerships. In these firms, a few general partners contribute some of

their own capital and raise additional capital from outside investors who are limited partners. The general partners control how all the capital is invested. Most often they will actively participate in running the businesses they choose to invest in. The outside investors play no active role in the partnership other than monitoring how their investments are performing.

Limited Liability Companies

A **limited liability company (LLC)** is a limited partnership without a general partner. That is, all the owners have limited liability, but unlike limited partners, they can also run the business.

The LLC is a relatively new phenomenon in the United States. The first state to pass a statute allowing the creation of an LLC was Wyoming in 1977; the last was Hawaii in 1997. Internationally, companies with limited liability are much older and established. LLCs rose to prominence first in Germany over 100 years ago as a *Gesellschaft mit beschränkter Haftung* (GmbH) and then in other European and Latin American countries. An LLC is known in France as a *Société à responsabilité limitée* (SARL), and by similar names in Italy (SRL) and Spain (SL).

Corporations

The distinguishing feature of a **corporation** is that it is a legally defined, artificial being (a judicial person or legal entity), separate from its owners. As such, it has many of the legal powers that people have. It can enter into contracts, acquire assets, incur obligations, and, as we have already established, it enjoys protection under the U.S. Constitution against the seizure of its property. Because a corporation is a legal entity separate and distinct from its owners, it is solely responsible for its own obligations. Consequently, the owners of a corporation (or its employees, customers, etc.) are not liable for any obligations the corporation enters into. Similarly, the corporation is not liable for any personal obligations of its owners.

Formation of a Corporation. Corporations must be legally formed, which means that the state in which it is incorporated must formally give its consent to the incorporation by chartering it. Setting up a corporation is therefore considerably more costly than setting up a sole proprietorship. Delaware has a particularly attractive legal environment for corporations, so many corporations choose to incorporate there. For jurisdictional purposes, a corporation is a citizen of the state in which it is incorporated. Most firms hire lawyers to create a corporate charter that includes formal articles of incorporation and a set of bylaws. The corporate charter specifies the initial rules that govern how the corporation is run.

Ownership of a Corporation. There is no limit on the number of owners a corporation can have. Because most corporations have many owners, each owner owns only a small fraction of the corporation. The entire ownership stake of a corporation is divided into shares known as **stock**. The collection of all the outstanding shares of a corporation is known as the **equity** of the corporation. An owner of a share of stock in the corporation is known as a **shareholder**, **stockholder**, or **equity holder** and is entitled to **dividend payments**, that is, payments made at the discretion of the corporation to its equity holders. Shareholders usually receive a share of the dividend payments that is proportional to the amount of stock they own. For example, a shareholder who owns 25% of the firm's shares will be entitled to 25% of the total dividend payment.

A unique feature of a corporation is that there is no limitation on who can own its stock. That is, an owner of a corporation need not have any special expertise or qualification. This feature allows free trade in the shares of the corporation and provides one of the most important advantages of organizing a firm as a corporation rather than as sole proprietorship, partnership, or LLC. Corporations can raise substantial amounts of capital because they can sell ownership shares to anonymous outside investors.

The availability of outside funding has enabled corporations to dominate the economy, as shown by Panel (b) of Figure 1.1. Let's take one of the world's largest firms, Walmart Inc., as an example. Walmart had over 2 million employees, and reported annual revenue of \$560 billion in 2021. Indeed, the top six U.S. companies by sales volume in 2021 (Walmart, Amazon, Apple, Exxon Mobil, CVS, and United Health) had combined sales of over \$2 trillion, an amount significantly larger than the total sales of the more than 25 million U.S. sole proprietorships.

Tax Implications for Corporate Entities

An important difference between the types of organizational forms is the way they are taxed. Because a corporation is a separate legal entity, a corporation's profits are subject to taxation separate from its owners' tax obligations. In effect, shareholders of a corporation pay taxes twice. First, the corporation pays tax on its profits, and then when the remaining profits are distributed to the shareholders, the shareholders pay their own personal income tax on this income. This system is sometimes referred to as double taxation.

EXAMPLE 1.1

Taxation of Corporate Earnings

Problem

You are a shareholder in a corporation. The corporation earns \$8 per share before taxes. After it has paid taxes, it will distribute the rest of its earnings to you as a dividend. The dividend is income to you, so you will then pay taxes on these earnings. The corporate tax rate is 25% and your tax rate on dividend income is 20%. How much of the earnings remains after all taxes are paid?

Solution

First, the corporation pays taxes. It earned \$8 per share, but must pay $0.25 \times \$8 = \2 to the government in corporate taxes. That leaves \$6 to distribute. However, you must pay $0.20 \times \$6 = \1.20 in income taxes on this amount, leaving $\$6 - \$1.20 = \$4.80$ per share after all taxes are paid. As a shareholder you only end up with \$4.80 of the original \$8 in earnings; the remaining $\$2 + \$1.20 = \$3.20$ is paid as taxes. Thus, your total effective tax rate is $3.20/8 = 40\%$.

S Corporations. The corporate organizational structure is the only organizational structure subject to double taxation. However, the U.S. Internal Revenue Code allows an exemption from double taxation for **"S" corporations**, which are corporations that elect subchapter S tax treatment. Under these tax regulations, the firm's profits (and losses) are not subject to corporate taxes, but instead are allocated directly to shareholders based on their ownership share. The shareholders must include these profits as income on their individual tax returns (even if no money is distributed to them). However, after the shareholders have paid income taxes on these profits, no further tax is due.

Corporate Taxation Around the World

Most countries offer investors in corporations some relief from double taxation. Thirty countries make up the Organisation for Economic Co-operation and Development (OECD), and of these countries, only Ireland offers no relief whatsoever. A few countries, including Australia, Canada, Chile, Mexico, and New Zealand, give shareholders a tax credit for the amount of corporate taxes paid, while others, such as Estonia and Latvia, fully or partially exempt dividend income from individual taxes. The United States offers partial relief by having a lower tax rate on dividend income than on other sources of income. Currently, for most investors

dividends are taxed at up to 20%, a rate significantly below their personal income tax rate. Despite this relief, the effective corporate tax rate in the U.S. had been one of the highest in the world—in 2017 it was nearly 30% above the median for the OECD.* Reducing this disparity was a key motive of the **Tax Cut and Jobs Act of 2017 (TCJA)** which, among other changes, lowered the federal corporate tax rate from 35% to 21% and included provisions that made it less attractive for U.S. firms to seek tax havens overseas.

*OECD Tax Database Table II.4

EXAMPLE 1.2

Taxation of S Corporation Earnings

Problem

Rework Example 1.1 assuming the corporation in that example has elected subchapter S treatment and your tax rate on non-dividend income is 35%.

Solution

In this case, the corporation pays no taxes. It earned \$8 per share. Whether or not the corporation chooses to distribute or retain this cash, you must pay $0.35 \times \$8 = \2.80 in income taxes, which is \$0.40 lower than the \$3.20 paid in Example 1.1.²

The government places strict limitations on the qualifications for subchapter S tax treatment. In particular, the shareholders of such corporations must be individuals who are U.S. citizens or residents, and there can be no more than 100 of them. Because most corporations have no restrictions on who owns their shares or the number of shareholders, they cannot qualify for subchapter S treatment. Thus most large corporations are **“C” corporations**, which are corporations subject to corporate taxes. S corporations account for less than one quarter of all corporate revenue.

CONCEPT CHECK

1. What is a limited liability company (LLC)? How does it differ from a limited partnership?
2. What are the advantages and disadvantages of organizing a business as a corporation?

1.2 Ownership Versus Control of Corporations

It is often not feasible for the owners of a corporation to have direct control of the firm because there are sometimes many owners, each of whom can freely trade his or her stock. That is, in a corporation, direct control and ownership are often separate. Rather than the owners, the *board of directors* and *chief executive officer* possess direct control of the corporation. In this section, we explain how the responsibilities for the corporation are divided between these two entities and how together they shape and execute the goals of the firm.

The Corporate Management Team

The shareholders of a corporation exercise their control by electing a **board of directors**, a group of people who have the ultimate decision-making authority in the corporation. In most corporations, each share of stock gives a shareholder one vote in the election of the board of directors,

² In reality the tax savings might be even higher. Under the new tax code some owners of S corporations will be able to shield 20% of their income from taxes.

David Viniar was Chief Financial Officer and Executive Vice President at Goldman Sachs from 1999 until 2013. As the firm's CFO, he played a leading role in the firm's conversion to a corporation in 1999—the last major investment bank to do so—and charting the firm's course through the financial crisis of 2008–2009, when it became a bank holding company.

QUESTION: *What are the advantages of partnerships and corporations?*

ANSWER: We debated this question at length when we were deciding whether to go public or stay a private partnership in the mid-1990s. There were good arguments on both sides. Those in favor of going public argued we needed greater financial and strategic flexibility to achieve our aggressive growth and market leadership goals. As a public corporation, we would have a more stable equity base to support growth and disperse risk; increased access to large public debt markets; publicly traded securities with which to undertake acquisitions and reward and motivate our employees; and a simpler and more transparent structure with which to increase scale and global reach.

Those against going public argued our private partnership structure worked well and would enable us to achieve our financial and strategic goals. As a private partnership, we could generate enough capital internally and in the private placement markets to fund growth; take a longer-term view of returns on our investments with less focus on earnings volatility, which is not valued in public companies; and retain voting control and alignment of the partners and the firm.

A big perceived advantage of our private partnership was its sense of distinctiveness and mystique, which reinforced our culture of teamwork and excellence and helped differentiate us from our competitors. Many questioned whether the special qualities of our culture would survive if the firm went public.

QUESTION: *What was the driving force behind the conversion?*

ANSWER: We ultimately decided to go public for three main reasons: to secure permanent capital to grow; to be able to use publicly traded securities to finance strategic acquisitions; and to enhance the culture of ownership and gain compensation flexibility.

INTERVIEW WITH DAVID VINIAR



QUESTION: *Did the conversion achieve its goals?*

ANSWER: Yes. As a public company, we have a simpler, bigger and more permanent capital base, including enhanced long-term borrowing capacity in the public debt markets. We have drawn on substantial capital resources to serve clients, take advantage of new business opportunities, and better control our own destiny through changing economic and business conditions. We have been able to use stock to finance key acquisitions and support large strategic and financial investments. Given how the stakes in our industry changed, how capital demands grew, going public when we did fortunately positioned us to compete effectively through the cycle.

Our distinctive culture of teamwork and excellence has thrived in public form, and our equity compensation programs turned out better than we could have hoped. Making everyone at Goldman Sachs an owner, rather than just 221 partners, energized all our employees. The growing size and scope of our business—not the change to public form—has presented the greatest challenges to the positive aspects of our culture.

QUESTION: *What prompted Goldman's decision to become a bank holding company in Fall 2008?*

ANSWER: The market environment had become extraordinarily unstable following the collapse of Bear Stearns in March 2008. There was an increased focus on the SEC-supervised broker/dealer business model, and in September, market sentiment had become increasingly negative with growing concerns over Lehman Brothers' solvency. Following the bankruptcy of Lehman Brothers and the sale of Merrill Lynch in the middle of September, and notwithstanding the reporting of quite strong earnings by both Goldman Sachs and Morgan Stanley, it became clear to us that the market viewed oversight by the Federal Reserve and the ability to source insured bank deposits as offering a greater degree of safety and soundness. By changing our status, we gained all the benefits available to our commercial banking peers, including access to permanent liquidity and funding, without affecting our ability to operate or own any of our current businesses or investments.

so investors with the most shares have the most influence. When one or two shareholders own a very large proportion of the outstanding stock, these shareholders may either be on the board of directors themselves, or they may have the right to appoint a number of directors.

The board of directors makes rules on how the corporation should be run (including how the top managers in the corporation are compensated), sets policy, and monitors the performance of the company. The board of directors delegates most decisions that involve day-to-day running of the corporation to its management. The **chief executive officer (CEO)** is charged with running the corporation by instituting the rules and policies set by the board of directors. The size of the rest of the management team varies from corporation to corporation. The separation of powers within corporations between the board of directors and the CEO is not always distinct. In fact, it is not uncommon for the CEO also to be the chairman of the board of directors. The most senior financial manager is the **chief financial officer (CFO)**, who often reports directly to the CEO. Figure 1.2 presents part of a typical organizational chart for a corporation, highlighting the key positions a financial manager may take.

The Financial Manager

Within the corporation, financial managers are responsible for three main tasks: making investment decisions, making financing decisions, and managing the firm's cash flows.

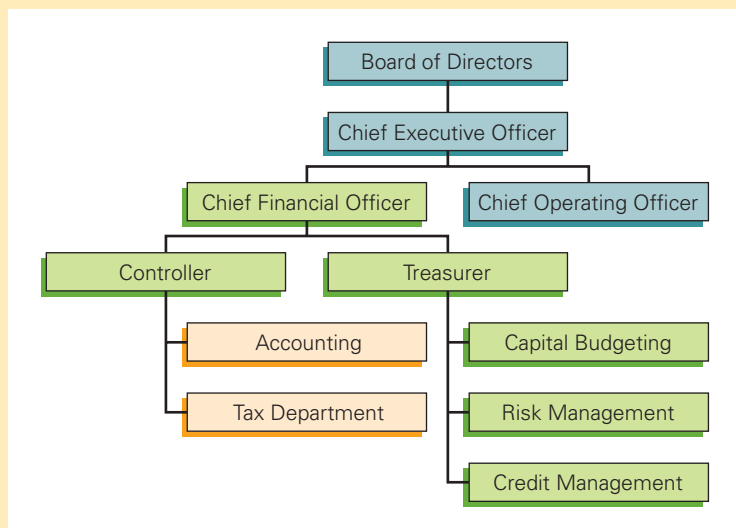
Investment Decisions. The financial manager's most important job is to make the firm's investment decisions. The financial manager must weigh the costs and benefits of all investments and projects and decide which of them qualify as good uses of the money stockholders have invested in the firm. These investment decisions fundamentally shape what the firm does and whether it will add value for its owners. In this book, we will develop the tools necessary to make these investment decisions.

Financing Decisions. Once the financial manager has decided which investments to make, he or she also decides how to pay for them. Large investments may require the corporation to raise additional money. The financial manager must decide whether to raise more money from new and existing owners by selling more shares of stock (equity) or to borrow the money (debt). In this book, we will discuss the characteristics of each source of funds and how to decide which one to use in the context of the corporation's overall mix of debt and equity.

FIGURE 1.2

Organizational Chart of a Typical Corporation

The board of directors, representing the stockholders, controls the corporation and hires the Chief Executive Officer who is then responsible for running the corporation. The Chief Financial Officer oversees the financial operations of the firm, with the Controller managing both tax and accounting functions, and the Treasurer responsible for capital budgeting, risk management, and credit management activities.



FINANCE IN TIMES OF DISRUPTION The Dodd-Frank Act

In response to the 2008 financial crisis, the U.S. federal government reevaluated its role in the control and management of financial institutions and private corporations. Signed into law on July 21, 2010, the **Dodd-Frank Wall Street Reform and Consumer Protection Act** brought a sweeping change to financial regulation in response to widespread calls for financial regulatory system reform after the near collapse of the world's financial system in the fall of 2008 and the ensuing global credit crisis. History indeed repeats itself: It was in the wake of the 1929 stock market crash and subsequent Great Depression that Congress passed the Glass-Steagall Act establishing the Federal Deposit Insurance Corporation (FDIC) and instituted significant bank reforms to regulate transactions between commercial banks and securities firms.

The Dodd-Frank Act aims to (i) promote U.S. financial stability by “improving accountability and transparency in the financial system,” (ii) put an end to the notion of “too big to fail,” (iii) “protect the American taxpayer by ending bailouts,” and (iv) “protect consumers from abusive financial services practices.”* Time will tell whether the Act will actually achieve these important goals.

Implementing the wide-ranging financial reforms in the Dodd-Frank Act required the work and coordination of many federal agencies, either through rulemaking or other regulatory actions. A decade after the crisis, just over two-thirds of the rules had been finalized.

* The full text of the act is available from the U. S. Government publishing Office: <https://www.gpo.gov/fdsys/pkg/PLAW-111publ203>

Cash Management. The financial manager must ensure that the firm has enough cash on hand to meet its day-to-day obligations. This job, also commonly known as managing working capital, may seem straightforward, but in a young or growing company, it can mean the difference between success and failure. Even companies with great products require significant amounts of money to develop and bring those products to market. Consider the \$150 million Apple spent during its secretive development of the iPhone, the \$32 billion Boeing spent producing the 787 before it even left the ground, or the \$16 billion Audi plans to spend by 2023 on self-driving technology. A company typically burns through a significant amount of cash developing a new product before its sales generate income. The financial manager's job is to make sure that access to cash does not hinder the firm's success.

The Goal of the Firm

In theory, the goal of a firm should be determined by the firm's owners. A sole proprietorship has a single owner who runs the firm, so the goals of a sole proprietorship are the same as the owner's goals. But in organizational forms with multiple owners, the appropriate goal of the firm—and thus of its managers—is not as clear.

Many corporations have thousands of owners (shareholders). Each owner is likely to have different interests and priorities. Whose interests and priorities determine the goals of the firm? Later in the book, we examine this question in more detail. However, you might be surprised to learn that the interests of shareholders are aligned for many, if not most, important decisions. That is because, regardless of their own personal financial position and stage in life, all the shareholders will agree that they are better off if management makes decisions that increase the value of their shares. For example, by April 2022, Apple shares were worth over 760 times as much as they were in October 2001, when the first iPod was introduced. Clearly, regardless of their preferences and other differences, all investors who held shares of Apple stock over this period have benefited from the investment decisions Apple's managers have made.

The Firm and Society

Are decisions that increase the value of the firm's equity beneficial for society as a whole? Most often they are. While Apple's shareholders have become much richer since 2001, its customers also are better off with products like the iPod and iPhone that they might otherwise never

have had. More generally, firms create value for their shareholders by producing products or services that are valuable to their customers and creating jobs that attract employees.

The problem occurs when increasing the value of equity comes at the expense of others. Consider a corporation that, in the course of business, pollutes the environment and does not pay the costs to clean up the pollution. Alternatively, a corporation may not itself pollute, but use of its products may harm the environment. In such cases, decisions that increase shareholder wealth can be costly for society as a whole.

The 2008 financial crisis highlighted another example of decisions that can increase shareholder wealth but are costly for society. In the early part of the last decade, banks took on excessive risk. For a while, this strategy benefited the banks' shareholders. But when the bets went bad, the resulting financial crisis harmed the broader economy.

When the actions of the corporation impose harm on others in the economy, appropriate public policy and regulation is required to assure that corporate interests and societal interests remain aligned. Sound public policy should allow firms to continue to pursue the maximization of shareholder value in a way that benefits society overall.

Ethics and Incentives within Corporations

But even when all the owners of a corporation agree on the goals of the corporation, these goals must be implemented. In a simple organizational form like a sole proprietorship, the owner, who runs the firm, can ensure that the firm's goals match his or her own. But a corporation is run by a management team, separate from its owners, giving rise to conflicts of interest. How can the owners of a corporation ensure that the management team will implement their goals?

Agency Problems. Many people claim that because of the separation of ownership and control in a corporation, managers have little incentive to work in the interests of the shareholders when this means working against their own self-interest. Economists call this

Shareholder versus Stakeholder Value

Non-financial goals and Environmental, Social and Governance (ESG) considerations have been highlighted in recent high profile statements from large asset managers, such as Larry Fink (CEO of Blackrock), and by the Business Roundtable.*

While the goal of a financial manager is to increase the value of the firm to its shareholders, this responsibility does not imply that the impact of the firm's decisions on other stakeholders, such as employees or customers, can be ignored. Profitable firms are those that create value for their customers, and that can include producing in a way that aligns with customer preferences on environmental and social issues. Similarly, if the firm makes decisions that benefit employees (for example, increasing their job security or providing better health benefits), it will be able to attract better employees and benefit from increased productivity. On the other hand, if customers or employees anticipate that the firm is likely to exploit them, they will pay less for its products and demand higher wages. Thus, to maximize shareholder value, the financial manager must consider the impact of her decision on all stakeholders of the firm.

In fact, these points are emphasized in Fink's letter (Blackrock is the world's largest asset manager, making it the largest shareholder in many companies); Fink argues,

"Stakeholder capitalism is ... capitalism, driven by mutually beneficial relationships between you and the employees, customers, suppliers, and communities your company relies on to prosper. This is the power of capitalism. In today's globally interconnected world, a company must create value for and be valued by its full range of stakeholders in order to deliver long-term value for its shareholders."

When firms do make decisions that affect firm value and also have important social consequences, the job of a financial manager is to quantify the impact both on the firm and society, allowing the CEO, the board, and ultimately the shareholders to evaluate the tradeoff and make an informed decision. Finally, one should not lose sight of the fact that a company must be making sound financial decisions in order to have the resources (profit) to allocate to ESG improvements and stakeholder welfare. Failing companies do not have the luxury of such considerations.

*<https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter>; <https://www.businessroundtable.org/business-roundtable-redefines-the-purpose-of-a-corporation-to-promote-an-economy-that-serves-all-americans>.

FINANCE IN TIMES OF DISRUPTION The Dodd-Frank Act on Corporate Compensation

Compensation is one of the most important conflicts of interest between corporate executives and shareholders. To limit senior corporate executives' influence over their own compensation and prevent excessive compensation, the Act directs the SEC to adopt new rules that:

- Mandate the independence of a firm's compensation committee and its advisers.
- Provide shareholders the opportunity to approve—in a non-binding, advisory vote—the compensation of executive officers at least once every three years (referred to as a “Say-on-Pay” vote).
- Require firm disclosure and shareholder approval of large bonus payments (so-called “golden parachutes”) to ousted senior executives as the result of a takeover.
- Require disclosure of the relationship of executive pay to the company's performance, as well as the ratio between the CEO's total compensation and that of the median employee.
- Require disclosure of whether executives are permitted to hedge their stock or option holdings.
- Create “clawback” provisions that allow firms to recoup compensation paid based on erroneous financial results.

As of early 2022, however, the last requirement had not yet been fully implemented by the SEC.

an **agency problem**—when managers, despite being hired as the agents of shareholders, put their own self-interest ahead of the interests of shareholders. Managers face the ethical dilemma of whether to adhere to their responsibility to put the interests of shareholders first, or to do what is in their own personal best interest.

This agency problem is commonly addressed in practice by minimizing the number of decisions managers must make for which their own self-interest substantially differs from the interests of the shareholders. For example, managers' compensation contracts are designed to ensure that most decisions in the shareholders' interest are also in the managers' interests; shareholders often tie the compensation of top managers to the corporation's profits or perhaps to its stock price. There is, however, a limitation to this strategy. By tying compensation too closely to performance, the shareholders might be asking managers to take on more risk than they are comfortable taking. As a result, managers may not make decisions that the shareholders want them to, or it might be hard to find talented managers willing to accept the job. On the other hand, if compensation contracts reduce managers' risk by rewarding good performance but limiting the penalty associated with poor performance, managers may have an incentive to take excessive risk.

Further potential for conflicts of interest and ethical considerations arise when some stakeholders in the corporation benefit and others lose from a decision. Shareholders and managers are two stakeholders in the corporation, but others include the regular employees and the communities in which the company operates, for example. Managers may decide to take the interests of other stakeholders into account in their decisions, such as keeping a loss-generating factory open because it is the main provider of jobs in a small town, paying above-market wages to factory workers in a developing country, or operating a plant at a higher environmental standard than local law mandates.

In some cases, these actions that benefit other stakeholders also benefit the firm's shareholders by creating a more dedicated workforce, generating positive publicity with customers, or other indirect effects. In other instances, when these decisions benefit other stakeholders at shareholders' expense, they represent a form of corporate charity. Indeed, many corporations explicitly donate (on behalf of their shareholders) to local and global charitable and political causes. For example, in 2019, Gilead Sciences gave nearly \$400 million in cash to charity (making it one of the largest corporate donors of cash in that year). These actions are costly and reduce shareholder wealth. Thus, while some shareholders might support such policies because they feel that they reflect their own moral and ethical priorities, it is unlikely that all shareholders will feel this way, leading to potential conflicts of interest amongst shareholders.

This conflict of interest can be resolved in cases for which shareholders can take equivalent actions on their own, such as giving cash to charity. In that case the firm can return the cash to

Citizens United v. Federal Election Commission

On January 21, 2010, the U.S. Supreme Court ruled on what some scholars have argued is the most important First Amendment case in many years. In *Citizens United v. Federal Election Commission* the Court held, in a controversial 5–4 decision, that the First Amendment allows corporations and unions to make political expenditures in

support of a particular candidate. This ruling overturned existing restrictions on political campaigning by corporations. But because it is highly unlikely that all shareholders of a corporation would unanimously support a particular candidate, allowing such activities effectively guarantees a conflict of interest.

shareholders who can then determine how much to give on their own. But this simple solution is not available when there are actions only the corporation can take, such as operating at a higher environmental standard. In that case, to maximize shareholder welfare, it is appropriate for the firm's managers to weigh conflicting shareholder preferences in their decision making.

The CEO's Performance. Another way shareholders can encourage managers to work in the interests of shareholders is to discipline them if they don't. If shareholders are unhappy with a CEO's performance, they could, in principle, pressure the board to oust the CEO. Disney's Michael Eisner, Hewlett Packard's Carly Fiorina, GE's Jeff Immelt, J. Crew's Mickey Drexler, and WeWork's Adam Neumann were all reportedly forced to resign by their boards. Despite these high-profile examples, directors and top executives are rarely replaced through a grassroots shareholder uprising. Instead, dissatisfied investors often choose to sell their shares. Of course, somebody must be willing to buy the shares from the dissatisfied shareholders. If enough shareholders are dissatisfied, the only way to entice investors to buy (or hold on to) the shares is to offer them a low price. Similarly, investors who see a well-managed corporation will want to purchase shares, which drives the stock price up. Thus, the stock price of the corporation is a barometer for corporate leaders that continuously gives them feedback on their shareholders' opinion of their performance.

When the stock performs poorly, the board of directors might react by replacing the CEO. In some corporations, however, the senior executives are entrenched because boards of directors do not have the will to replace them. Often the reluctance to fire results because the board members are close friends of the CEO and lack objectivity. In corporations in which the CEO is entrenched and doing a poor job, the expectation of continued poor performance will decrease the stock price. Low stock prices create a profit opportunity. In a **hostile takeover**, an individual or organization—sometimes known as a corporate raider—can purchase a large fraction of the stock and acquire enough votes to replace the board of directors and the CEO. With a new superior management team, the stock is a much more attractive investment, which would likely result in a price rise and a profit for the corporate raider and the other shareholders. Although the words “hostile” and “raider” have negative connotations, corporate raiders themselves provide an important service to shareholders. The mere threat of being removed as a result of a hostile takeover is often enough to discipline poorly performing managers and motivate boards of directors to make difficult decisions. Consequently, when a corporation's shares are publicly traded, a “market for corporate control” is created that encourages managers and boards of directors to act in the interests of their shareholders.

Corporate Bankruptcy. Ordinarily, a corporation is run on behalf of its shareholders. But when a corporation borrows money, the holders of the firm's debt also become investors in the corporation. While the debt holders do not normally exercise control over the firm, if the corporation fails to repay its debts, the debt holders are entitled to seize the assets of the corporation in compensation for the default. To prevent such a seizure, the firm may attempt to renegotiate with the debt holders, or file for bankruptcy protection in a federal court. (We describe the details of the bankruptcy process and its implications for corporate decisions in much more detail in Part 5 of the textbook.) Ultimately, however, if the firm is unable to repay or renegotiate with the debt holders, the control of the corporation's assets will be transferred to them.

Airlines in Bankruptcy

On December 9, 2002, United Airlines filed for bankruptcy protection following an unsuccessful attempt to convince the federal government to bail out the company's investors by providing loan guarantees. Although United remained in bankruptcy for the next three years, it continued to operate and fly passengers, and even expanded capacity in some markets. One of those expansions was "Ted," an ill-fated attempt by United to start a budget airline to compete directly with Southwest Airlines. In short, although United's original shareholders were wiped out, as far as customers were concerned it was business as usual. People continued to book tickets and United continued to fly and serve them.

It is tempting to think that when a firm files for bankruptcy, things are "over." But often, rather than liquidate the firm, bondholders and other creditors are better off allowing the firm to continue operating as a going concern. United was just one of many airlines to move in and out of bankruptcy since 2002; others include US Airways, Air Canada, Hawaiian Airlines, Northwest Airlines, and Delta Airlines. In November 2011, American Airlines became the latest airline to declare bankruptcy. Like United in 2002, American continued to operate while it cut costs and reorganized, returning to profitability in mid-2012. American ultimately settled with creditors in December 2013 as part of a merger agreement with US Airways.

Thus, when a firm fails to repay its debts, the end result is a change in ownership of the firm, with control passing from equity holders to debt holders. Importantly, bankruptcy need not result in a **liquidation** of the firm, which involves shutting down the business and selling off its assets. Even if control of the firm passes to the debt holders, it is in the debt holders' interest to run the firm in the most profitable way possible. Doing so often means keeping the business operating. For example, in 1990, Federated Department Stores declared bankruptcy. One of its best-known assets at the time was Bloomingdale's, a nationally recognized department store. Because Bloomingdale's was a profitable business, neither equity holders nor debt holders had any desire to shut it down, and it continued to operate in bankruptcy. In 1992, when Federated Department Stores was reorganized and emerged from bankruptcy, Federated's original equity holders had lost their stake in Bloomingdale's, but this flagship chain continued to perform well for its new owners, and its value as a business was not adversely affected by the bankruptcy.

Thus, a useful way to understand corporations is to think of there being two sets of investors with claims to its cash flows—debt holders and equity holders. As long as the corporation can satisfy the claims of the debt holders, ownership remains in the hands of the equity holders. If the corporation fails to satisfy debt holders' claims, debt holders may take control of the firm. Corporate bankruptcy is therefore best thought of as a *change in ownership* of the corporation, and not necessarily as a failure of the underlying business.

CONCEPT CHECK

1. What are the three main tasks of a financial manager?
2. What is a principal-agent problem that may exist in a corporation?
3. How may a corporate bankruptcy filing affect the ownership of a corporation?

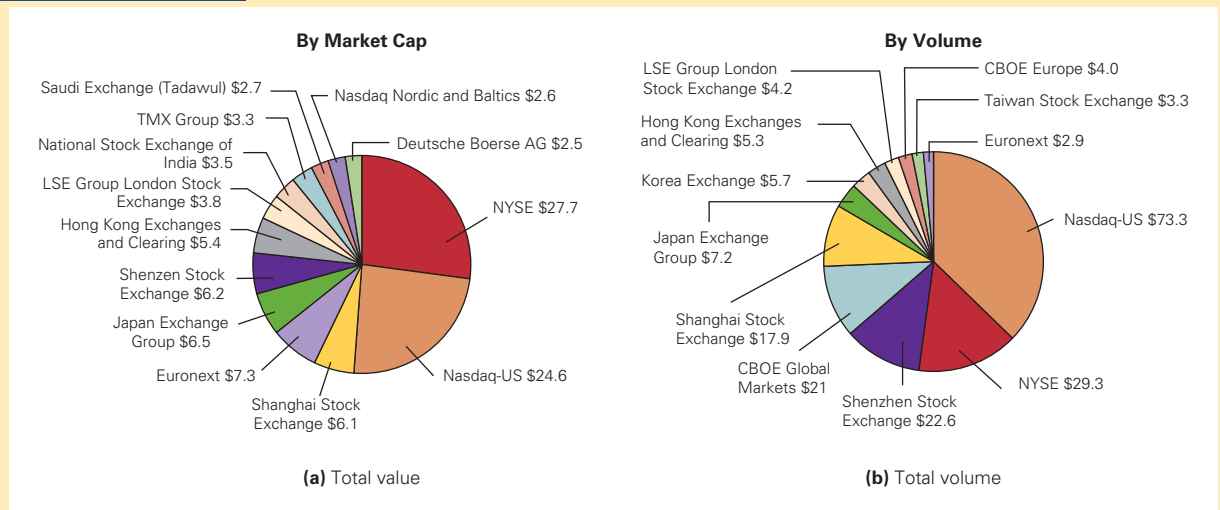
1.3 The Stock Market

As we have discussed, shareholders would like the firm's managers to maximize the value of their investment in the firm. The value of their investment is determined by the price of a share of the corporation's stock. Because **private companies** have a limited set of shareholders and their shares are not regularly traded, the value of their shares can be difficult to determine. But many corporations are **public companies**, whose shares trade on organized markets called a **stock market** (or **stock exchange**). Figure 1.3 shows the major exchanges worldwide, by total value of listed stocks and trading volume.

These markets provide *liquidity* and determine a market price for the company's shares. An investment is said to be **liquid** if it is possible to sell it quickly and easily for a price very close

FIGURE 1.3

Worldwide Stock Exchanges Ranked by Two Common Measures



The largest stock markets in the world (a) by total value of all domestic corporations listed on the exchange at year-end 2021 and (b) by total volume of shares traded on the exchange in 2021.

Source: www.world-exchanges.org

to the price at which you could contemporaneously buy it. This liquidity is attractive to outside investors, as it provides flexibility regarding the timing and duration of their investment in the firm. In addition, the research and trading of participants in these markets give rise to share prices that provide constant feedback to managers regarding investors' views of their decisions.

Primary and Secondary Stock Markets

When a corporation itself issues new shares of stock and sells them to investors, it does so on the **primary market**. After this initial transaction between the corporation and investors, the shares continue to trade in a **secondary market** between investors without the involvement of the corporation. For example, if you wish to buy 100 shares of Starbucks Coffee, you would place an order on a stock exchange, where Starbucks trades under the ticker symbol SBUX. You would buy your shares from someone who already held shares of Starbucks, not from Starbucks itself. Because firms only occasionally issue new shares, secondary market trading accounts for the vast majority of trading in the stock market.

Traditional Trading Venues

Historically, a firm would choose one stock exchange on which to list its stock, and almost all trade in the stock would occur on that exchange. In the U.S., the two most important exchanges are the New York Stock Exchange (NYSE) and the National Association of Security Dealers Automated Quotation (Nasdaq).

Prior to 2005, almost all trade on the NYSE took place on the exchange's trading floor in lower Manhattan. **Market makers** (known then on the NYSE as **specialists**) matched buyers and sellers. They posted two prices for every stock in which they made a market: the price at which they were willing to *buy* the stock (the **bid price**) and the price at which they were willing to *sell* the stock (the **ask price**). When a customer arrived and wanted to make a trade at these prices, the market maker would honor the posted prices (up to a limited number of shares) and make the trade even when they did not have another customer

Adena T. Friedman is President and Chief Executive Officer of Nasdaq and a member of the Board of Directors. With more than 20 years of industry leadership, she has focused on driving efficiency, product development, growth and expansion, shaping Nasdaq into a leading global exchange and technology solutions company.

QUESTION: *Why do public stock markets like Nasdaq play such an important role in economic growth?*

ANSWER: Financial markets are a fundamental engine of prosperity, economic growth, job creation, and innovation. Ensuring fair, secure, and accessible markets for all is vital to creating strong economies worldwide. The capital companies raise in the public equities markets catalyzes job creation and fuels innovation, which can become a virtuous cycle of economic growth. For individuals, healthy public markets are drivers of wealth creation and secure retirements. But for individuals to be willing to invest, they must be confident they will be able to sell at a fair price in the future. The competitive real-time price discovery that takes place in public markets allows buyers and sellers of equities to arrive instantly on an agreed-upon price, creating liquidity for investors and allowing capital to be deployed for other opportunities, innovation, and growth.

QUESTION: *Recent developments like the ability to trade fractional shares and the rise of intermediaries like Robinhood have increased access for individuals. Do you think this is a positive development?*

ANSWER: Our job as a market operator is to eliminate friction and maximize access, to give more investors direct access to markets and empower them to manage their money—and to get the benefits of compounding returns over time. We view increased access and increased engagement as a positive overall. It also means there is even greater importance on disclosure, transparency, and financial education so that every investor, whether institutional or individual, can make informed decisions as to the opportunities and risks associated with their investments.

Investing in the capital markets creates opportunity for wealth creation for individual investors, but there are

INTERVIEW WITH ADENA T. FRIEDMAN



always risks. We focus on teaching new investors those risks and the importance of being responsible in how you interact with markets. Any time a new constituent of investors comes into the markets, you need to make sure they are having a fair experience and are protected.

QUESTION: *Payment for order flow has enabled commission-free trading for retail investors. Are there potential downsides to this practice?*

ANSWER: New technology and initiatives have improved access to the markets by allowing a broader range of investors to in-

vest more inexpensively and easily. Payment for order flow is one initiative that developed as our markets have evolved. It's a process by which a broker can receive compensation for directing orders to a specific trading partner, or market maker. Because payment for order flow is complex and nuanced, Nasdaq does not believe there is a single, one-size-fits-all answer. Our most important principle is creating fair markets with level playing fields in which no participant has an unfair advantage or disadvantage.

QUESTION: *Nasdaq had historically been associated with technology stocks. Why is that and do you believe that it will continue to be true?*

ANSWER: Nasdaq continues to be home to innovators; we are currently the marketplace of choice for approximately 70% of publicly traded U.S. tech companies. To understand why tech companies choose Nasdaq, it's important to understand that we are, ourselves, a tech company, founded more than 50 years ago as the first fully digital marketplace. Innovation is in our DNA, and we have continually innovated the way markets are fundamentally structured, leveraging technology to create efficiencies for our issuers and greater opportunity for investors.

Looking forward, several trends are fundamentally reshaping what our markets and economies will look like over the next decade and decades—ranging from the modernization of markets to the evolution to a low-carbon global economy. These trends present opportunities for companies across all sectors.

willing to take the other side of the trade. In this way, market makers provided **liquidity** by ensuring that market participants always had somebody to trade with.

In contrast to the NYSE, the Nasdaq market never had a trading floor. Instead, all trades were completed over the phone or on a computer network. An important difference between the NYSE and Nasdaq was that on the NYSE, each stock had only one market maker. On the Nasdaq, stocks had multiple market makers who competed with one another. Each market maker posted bid and ask prices on the Nasdaq network that were viewed by all participants.

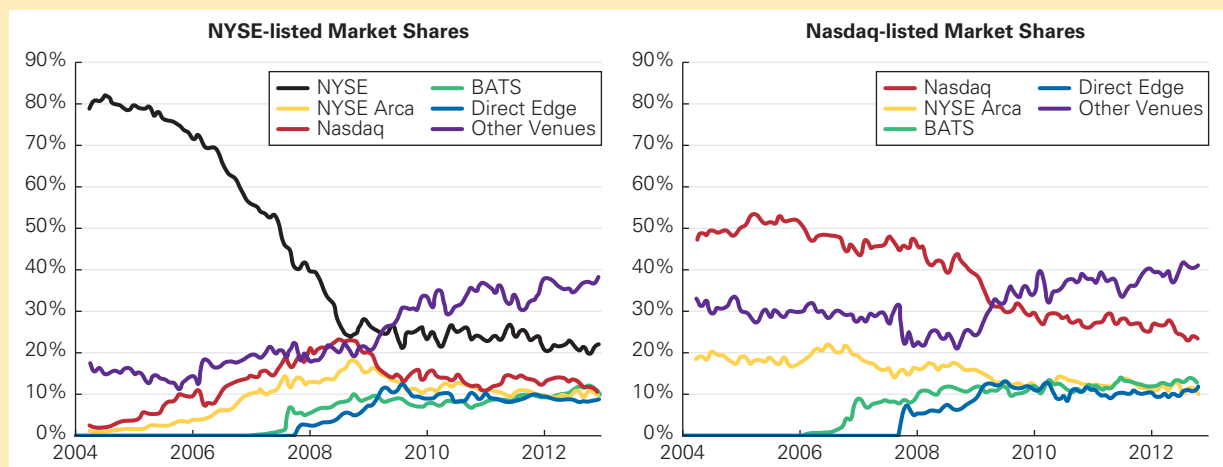
Market makers make money because ask prices are higher than bid prices. This difference is called the **bid-ask spread**. Customers always buy at the ask (the higher price) and sell at the bid (the lower price). The bid-ask spread is a **transaction cost** investors pay in order to trade. Because specialists on the NYSE took the other side of the trade from their customers, this cost accrued to them as a profit. This was the compensation they earned for providing a liquid market by standing ready to honor any quoted price. Investors also paid other forms of transactions costs like commissions.

New Competition and Market Changes

Stock markets went through enormous changes in the first decade of the 21st century. In 2005, the NYSE and Nasdaq exchanges accounted for over 75% of all trade in U.S. stocks. Since that time, however, competition from new, fully electronic exchanges and alternative trading systems has caused their market share to dramatically decline, as shown in Figure 1.4. By 2012, these new entrants handled more than 50% of all trades.

With this change in market structure, the role of an official market maker has largely disappeared. Because all transactions occur electronically with computers matching buy and sell orders, anyone can make a market in a stock by posting a **limit order**—an order to buy or sell a set amount at a fixed price. For example, a limit buy order might be an order to buy 100 shares of IBM at a price of \$138/share. The bid-ask spread of a stock is determined

FIGURE 1.4



Distribution of trading volume for NYSE-listed shares (left panel) and Nasdaq-listed shares (right panel). NYSE-Arca is the electronic trading platform of the NYSE. BATS and Direct Edge merged in 2014; these new electronic exchanges now handle about 20% of all trades. Other venues, including internal dealer platforms and so called “dark pools,” accounted for almost 40% of all trades in 2015.

Source: J. Angel, L. Harris, and C. Spatt, “Equity Trading in the 21st Century: An Update,” *Quarterly Journal of Finance* 5 (2015): 1–39.

by the outstanding limit orders. The limit sell order with the lowest price is the ask price. The limit buy order with the highest price is the bid price. Traders make the market in the stock by posting limit buy and sell orders. The collection of all limit orders is known as the **limit order book**. Exchanges make their limit order books public so that investors (or their brokers) can see the best bid and ask prices when deciding where to trade.

Traders who post limit orders provide the market with liquidity. On the other hand, traders who place **market orders**—orders that trade immediately at the best outstanding limit order—are said to be “takers” of liquidity. Providers of liquidity earn the bid-ask spread, but in so doing they risk the possibility of their orders becoming stale: When news about a stock arrives that causes the price of that stock to move, smart traders will quickly take advantage of the existing limit orders by executing trades at the old prices. To protect themselves against this possibility, liquidity providers need to constantly monitor the market, cancelling old orders and posting new orders when appropriate. So-called **high frequency traders (HFTs)** are a class of traders who, with the aid of computers, will place, update, cancel, and execute trades many times per second in response to new information as well as other orders, profiting both by providing liquidity and by taking advantage of stale limit orders.

Dark Pools

When trading on an exchange, investors are guaranteed the opportunity to trade immediately at the current bid or ask price, and transactions are visible to all traders when they occur. In contrast, alternative trading systems called **dark pools** do not make their limit order books visible. Instead, these dark pools offer investors the ability to trade at a better price (for example, the average of the bid and ask, thus saving the bid-ask spread), with the tradeoff being that the order might not be filled if an excess of either buy or sell orders is received. Trading on a dark pool is therefore attractive to traders who do not want to reveal their demand and who are willing to sacrifice the guarantee of immediacy for a potentially better price.

When dark pools are included, researchers estimate that in the U.S. alone there could be as many 50 venues in which to trade stocks. These venues compete with one another for order volume. Because traders value liquid markets, an important area of competition is liquidity—exchanges try to ensure that their limit order books are deep, that is, that they contain many orders. As a result, exchanges have been experimenting with different rules designed to encourage traders who provide liquidity and discourage traders who take advantage of stale limit orders. For example, some trading venues pay traders to post limit orders and charge traders who place market orders. Others pay for orders from retail investors and impose additional charges on high frequency trading. The proliferation of exchange venues has generated a wide variety of different compensation schemes. Indeed, CBOE/BATS operates different markets with different rules, essentially tailoring markets to the perceived needs of customers. It is highly unlikely that we have seen the end of these changes. Stock markets remain in a state of flux, and only time will tell what the eventual shakeout will look like.

CONCEPT CHECK

1. What important changes have occurred in the structure of stock markets in the last two decades?
2. What is the limit order book?
3. Why are people who post limit orders termed “providers” of liquidity?

1.4 Fintech: Finance and Technology

The relation between financial innovation and technical innovation has become known as **Fintech**. Although the term is new, there is nothing new about the use of advanced technology in the provision of financial services. Finance has always been on the cutting edge of technological change.

Telecommunications

Because the same financial securities are often traded on markets that are physically far apart, finance professionals have always been amongst the first adopters of improved communication technologies. Consider, for example, the introduction of the telegraph in the 1840s. Soon after New York and Philadelphia were linked by the telegraph, *The New York Herald* reported that “certain parties in New York and Philadelphia were employing the telegraph for speculating in stocks.” Not surprisingly, prices of the same security trading in both markets became significantly closer once the telegraph was introduced. The same thing happened when New York and New Orleans were linked. When the first reliable trans-atlantic cable linking London to New York was established, the effect was even more dramatic, presumably because the improvement over existing communication technology was larger.³

With the introduction of the telegraph came the first stock ticker system. It allowed the continuous transmission of stock prices using telegraph lines and was in effect the first digital electronic communications system. It remained in use until the 1970s when it was replaced by digital CRT technology systems and then ultimately computers and the Internet. Today, some traders use microwave technology to transmit information and orders at the highest possible speeds (which we describe in more detail in the “Arbitrage in Markets” box on page 118).

Security and Verification

Finance has spurred significant innovation in security and verification technology. Indeed, perhaps the greatest technological innovation of all time, the invention of cuneiform writing in Mesopotamia, derived from a need to verify transactions across distance. In the 1860s, the earliest version of the modern fax machine, the pantelegraph, was developed to allow banks to transmit signatures over telegraph lines, thereby greatly shortening the time needed to verify transactions at a distance.

Today finance remains at the cutting edge of verification technology. Based on advances in cryptography in the 1990s, **blockchain** technology allows a transaction to be recorded in a publicly verifiable way without the need for a trusted third party to certify the authenticity of the transaction. By enabling a public ledger of transactions, blockchain technology allows for the digital transfer of assets without the backing of a government or a central clearinghouse. In 2008, this conceptual idea became a reality with the introduction of bitcoin, the world’s first **cryptocurrency**—a currency whose creation and ownership is determined via a public blockchain. All bitcoin transactions are recorded in a public ledger using blockchain technology allowing individuals to create and trade bitcoins and to verify those transactions digitally.

³ For a detailed analysis of how the introduction of the telegraph affected financial markets see K. Garbade and W. Silber, “Technology, Communication and the Performance of Financial Markets: 1840–1975,” *Journal of Finance* 33 (3) June 1978.

Given the many millions of financial transactions that occur every hour that require verification, blockchain technology has the potential to reform how many financial transactions take place. But like any technological change, the success of the new system will depend on whether it can provide a significant advantage over current practices.

Automation of Banking Services

Technological innovation has also been important in the consumer sphere. Introduced in 1967, the automatic teller machine (ATM) was one of the earliest instances of automated customer service in any industry. Today, automated customer service is routine in banking. For example, it is possible to open an account, move money between accounts at different institutions, make payments to third parties, apply for and be approved for a loan without talking to a human being.

More recently, PayPal's Venmo, Tencent's WeChat, Block's Cash App and other smart-phone apps have made it easy for individuals to pay for goods and transfer money to others almost instantly. In the developing world, companies have brought a full range of automated banking services to individuals via their cellular phones, granting access to the modern financial system to millions of people who would otherwise not have access.

Investment advising is another traditional banking service that may potentially be disrupted by the recent growth in **robo-advisors**, computer programs that are intended to replace the work of financial advisors by providing detailed and customized investment recommendations. Whether consumers will embrace these new services with the same enthusiasm with which they embraced ATMs is an open question.

Big Data and Machine Learning

Long before the term "big data" was coined, financial organizations recognized the importance of collecting data and using it in decision making. Newspapers have always devoted space to reporting (and thereby storing) security prices. With the advent of computers, companies like Bloomberg arose whose sole purpose was the collection and dissemination of data. In the 1990s, stock exchanges began to make trade-by-trade data available, making these datasets one of first examples of what today is referred to as "big data." Today investors have access to an unprecedented array of financial data at very low cost. These data not only give individual investors an unprecedented window into the companies they invest in, it also allows both firms and policy-makers to make more informed decisions.

Another important use of data and technology in finance is in predicting price changes in the market. Early attempts to discern repeatable patterns in the data met with little success. But as technology advanced and computer power increased, companies like Renaissance Technologies and D.E. Shaw developed sophisticated pattern recognition software that successfully predicted very short-term price movements. An important reason for their success is that investors who trade based on information have an incentive to hide their advantage (and their information) by breaking up their trades over time. This behavior can potentially be exploited to predict future price moves. However, as these computer algorithms compete with each other to better predict price moves, and as traders adjust their strategies to make them less predictable, future price moves become harder to forecast and so a technological arms race has ensued.

The availability of data has enabled companies throughout the economy to better target their products to consumers, and financial services companies are no exception. In financial services, areas that have been particularly successful include retail financial services, lending, and insurance. Start-ups such as SoFi, LendingClub, and Upstart, as well as

established lenders like Capital One use machine learning to go beyond basic credit scores to make improved lending decisions. Similarly, insurance providers use big data to structure the insurance contracts they offer. Although these providers have opened new markets and may provide services at lower cost, there are also potential concerns. Customers that are found to be higher risk based on the machine learning algorithms may now pay more for the service or not be offered the service at all.

Competition

Technological advances, and the Internet in particular, have opened the way for non-finance organizations to provide financial services. For example, companies like Apple, PayPal, and Google provide payment services that traditionally have been provided by banks. Amazon and Square provide business loans by exploiting the data they collect on the vendors they service. Numerous start-ups are entering the market to provide new and improved financial services to customers, businesses, and banks themselves. This intense competition will likely spur further innovation.

If historical experience is any guide, finance will continue to lead the way in the adoption of new technologies. Any technological innovation that confers a competitive advantage has the potential to provide large profits to early adopters. Beyond that, the provision of financial services can create substantial value to end users and the broader economy. It is therefore no surprise that there continues to be large investment in Fintech. The innovations that result are likely to continue to reshape the financial industry in the years to come.

CONCEPT CHECK

1. In what ways has the finance industry been on the cutting edge of technology in the past?
2. What is blockchain technology, and how might it be useful in finance?

Key Points and Equations

1.1 The Four Types of Firms

- There are four types of firms in the United States: sole proprietorships, partnerships, limited liability companies, and corporations.
- Firms with unlimited personal liability include sole proprietorships and partnerships.
- Firms with limited liability include limited partnerships, limited liability companies, and corporations.
- A corporation is a legally defined artificial being (a judicial person or legal entity) that has many of the same legal powers as people. It can enter into contracts, acquire assets, incur obligations, and, as we have already established, it enjoys the protection under the U.S. Constitution against the seizure of its property.
- The shareholders in a C corporation effectively must pay tax twice. The corporation pays tax once and then investors must pay personal tax on any funds that are distributed.
- S corporations are exempt from the corporate income tax.

1.2 Ownership Versus Control of Corporations

- The ownership of a corporation is divided into shares of stock collectively known as equity. Investors in these shares are called shareholders, stockholders, or equity holders.

- The ownership and control of a corporation are separated. Shareholders exercise their control indirectly through the board of directors.
- Financial managers within the firm are responsible for three main tasks: making investment decisions, making financing decisions, and managing the firm's cash flows.
- Good public policy should ensure that when firms take actions that benefit their shareholders, they are also benefiting society.
- While the firm's shareholders would like managers to make decisions that maximize the firm's share price, managers often must balance this objective with the desires of other stakeholders (including themselves).
- Corporate bankruptcy can be thought of as a change in ownership and control of the corporation. The equity holders give up their ownership and control to the debt holders.

1.3 The Stock Market

- The shares of public corporations are traded on stock markets. The shares of private corporations do not trade on a stock market.
- Traders provide liquidity in stock markets by posting limit orders.
- The bid-ask spread is determined by the best bid and offer prices in the limit order book.

1.4 Fintech: Finance and Technology

- Fintech is a recent term describing the use of new technologies in finance. But the financial industry has often been an early adopter of technological innovation.
 - Important examples of the use of new technology include telecommunications, security and verification, automation of banking services, and big data and machine learning.
 - Fintech has led to new competition in all aspects of financial services. This new competition may ultimately reshape the banking industry.
-

Key Terms

agency problem <i>p. 44</i>	limited liability company (LLC) <i>p. 37</i>
ask price <i>p. 47</i>	limited partnership <i>p. 36</i>
bid-ask spread <i>p. 49</i>	liquid <i>p. 46</i>
bid price <i>p. 47</i>	liquidation <i>p. 46</i>
blockchain <i>p. 51</i>	liquidity <i>p. 49</i>
board of directors <i>p. 39</i>	market makers <i>p. 47</i>
“C” corporations <i>p. 39</i>	market orders <i>p. 50</i>
chief executive officer (CEO) <i>p. 41</i>	partnership <i>p. 36</i>
chief financial officer (CFO) <i>p. 41</i>	primary market <i>p. 47</i>
corporation <i>p. 37</i>	private companies <i>p. 46</i>
cryptocurrency <i>p. 51</i>	public companies <i>p. 46</i>
dark pools <i>p. 50</i>	robo-advisors <i>p. 52</i>
dividend payments <i>p. 37</i>	“S” corporations <i>p. 38</i>
Dodd-Frank Act <i>p. 42</i>	secondary market <i>p. 47</i>
equity <i>p. 37</i>	shareholder <i>p. 37</i>
equity holder <i>p. 37</i>	sole proprietorship <i>p. 35</i>
Fintech <i>p. 51</i>	specialists <i>p. 47</i>
high frequency traders (HFTs) <i>p. 50</i>	stock <i>p. 37</i>
hostile takeover <i>p. 45</i>	stock market (or stock exchange) <i>p. 46</i>
limit order <i>p. 49</i>	stockholder <i>p. 37</i>
limit order book <i>p. 50</i>	Tax Cut and Jobs Act of 2017 (TCJA) <i>p. 39</i>
limited liability <i>p. 36</i>	transaction cost <i>p. 49</i>

Further Reading

Readers interested in John Marshall's decision that led to the legal basis for the corporation can find a more detailed description of the decision in J. Smith, *John Marshall: Definer of a Nation* (Henry Holt, 1996): 433–438.

An informative discussion that describes the objective of a corporation can be found in M. Jensen, "Value Maximization, Stakeholder Theory, and the Corporate Objective Function," *Journal of Applied Corporate Finance* (Fall 2001): 8–21. For an analysis of how shareholder voting can guide firms to maximize shareholder welfare when firm decisions have social externalities, see O. Hart and L. Zingales, "Companies Should Maximize Shareholder Welfare Not Market Value," *Journal of Law, Finance, and Accounting* (2017): 247–274.

For background on what determines the goals of corporate managers and how they differ from shareholders' goals, read M. Jensen and W. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* 3 (1976): 305–360; J. Core, W. Guay, and D. Larker, "Executive Equity Compensation and Incentives: A Survey," *Federal Reserve Bank of New York Economic Policy Review* 9 (April 2003): 27–50.

The following papers explain corporate governance and ownership around the world: F. Barca and M. Becht, *The Control of Corporate Europe* (Oxford University Press, 2001); D. Denis and J. McConnell, "International Corporate Governance," *Journal of Financial Quantitative Analysis* 38 (2003): 1–36; R. La Porta, F. Lopez-de-Silanes, and A. Shleifer, "Corporate Ownership Around the World," *Journal of Finance* 54 (1999): 471–517. Readers interested in a more detailed discussion of how taxes affect incorporation can consult J. MacKie-Mason and R. Gordon, "How Much Do Taxes Discourage Incorporation?" *Journal of Finance* 52 (1997): 477–505.

The following papers provide a summary of the recent changes in stock markets: J. Angel, L. Harris, and C. Spatt, "Equity Trading in the 21st Century: An Update," *Quarterly Journal of Finance* 5 (2015): 1–39 and M. O'Hara, "High frequency market microstructure," *Journal of Financial Economics* 116 (2015): 257–270.

Problems The Four Types of Firms

1. What is the most important difference between a corporation and *all* other organizational forms?
2. What does the phrase *limited liability* mean in a corporate context?
3. Which organizational forms give their owners limited liability?
4. What are the main advantages and disadvantages of organizing a firm as a corporation?
5. Explain the difference between an S corporation and a C corporation.
6. You are a shareholder in a C corporation. The corporation earns \$2 per share before taxes. Once it has paid taxes it will distribute the rest of its earnings to you as a dividend. The corporate tax rate is 40% and the personal tax rate on (both dividend and non-dividend) income is 30%. How much is left for you after all taxes are paid?
7. Repeat Problem 6 assuming the corporation is an S corporation.

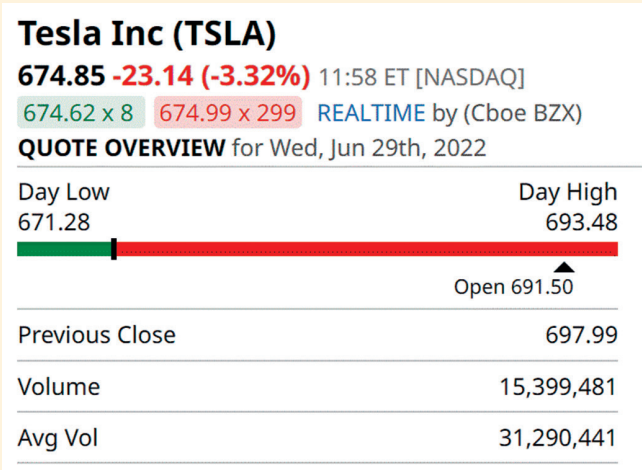
Ownership Versus Control of Corporations

8. You have decided to form a new start-up company developing applications for the iPhone. Give examples of the three distinct types of financial decisions you will need to make.
9. When a pharmaceutical company develops a new drug, it often receives patent protection for that medication, allowing it to charge a higher price. Explain how this public policy of providing patent protection might help align the corporation's interests with society's interests.

- 10. Corporate managers work for the owners of the corporation. Consequently, they should make decisions that are in the interests of the owners, rather than their own. What strategies are available to shareholders to help ensure that managers are motivated to act this way?
- 11. Suppose you are considering renting an apartment. You, the renter, can be viewed as an agent while the company that owns the apartment can be viewed as the principal. What principal-agent conflicts do you anticipate? Suppose, instead, that you work for the apartment company. What features would you put into the lease agreement that would give the renter incentives to take good care of the apartment?
- 12. You are the CEO of a company and you are considering entering into an agreement to have your company buy another company. You think the price might be too high, but you will be the CEO of the combined, much larger company. You know that when the company gets bigger, your pay and prestige will increase. What is the nature of the agency conflict here and how is it related to ethical considerations?
- 13. Are hostile takeovers necessarily bad for firms or their investors? Explain.

The Stock Market

- 14. What is the difference between a public and a private corporation?
- 15. Describe the important changes that have occurred in stock markets over the last decade.
- 16. Explain why the bid-ask spread is a transaction cost.
- 17. Explain how the bid-ask spread is determined in most markets today.
- 18. The following quote on Tesla stock appeared on June 29, 2022, on [Barchart.com](#):



- If you wanted to buy Tesla, what price would you pay? How much would you receive if you wanted to sell Tesla?
- 19. Suppose the following orders are received by an exchange for AT&T stock:
 - Limit Order: Buy 200 shares at \$25
 - Limit Order: Sell 200 shares at \$26
 - Limit Order: Sell 100 shares at \$25.50
 - Limit Order: Buy 100 shares at \$25.25

- a. What are the best bid and ask prices for AT&T stock?
- b. What is the current bid-ask spread for AT&T stock?
- c. Suppose a market order arrives to buy 200 shares of AT&T. What average price will the buyer pay?
- d. After the market order in (c) clears, what are the new best bid and ask prices, and what is the new bid-ask spread for AT&T?

Fintech: Finance and Technology

20. Why has finance historically been an early adopter of new technology?
21. Choose 3 of the following companies and describe how they are utilizing new technology in the provision of financial services.
 - a. Wealthfront
 - b. LendingTree
 - c. Metromile
 - d. Acorns
 - e. Robinhood
 - f. Stripe
 - g. Klarna
 - h. SoFi
 - i. Lemonade
22. Identify a new fintech startup and describe its business model. What new services or features does it provide to its customers? How does it earn its revenue? How does it differ from traditional providers?

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Introduction to Financial Statement Analysis

CHAPTER

2

AS WE DISCUSSED IN CHAPTER 1, ONE OF THE GREAT ADVANTAGES of the corporate organizational form is that it places no restriction on who can own shares in the corporation. Anyone with money to invest is a potential investor. As a result, corporations are often widely held, with investors ranging from individuals who hold 100 shares to mutual funds and institutional investors who own millions of shares. For example, in 2022, International Business Machines Corporation (IBM) had about 900 million shares outstanding held by over 360,000 shareholders. Most shareholders were small. The Vanguard Group was the largest shareholder with about an 8.5% stake. Less than 1% of the company was owned by insiders (IBM executives).

Although the corporate organizational structure greatly facilitates the firm's access to investment capital, it also means that stock ownership is most investors' sole tie to the company. How, then, do investors learn enough about a company to know whether or not they should invest in it? How can financial managers assess the success of their own firm and compare it to the performance of competitors? One way firms evaluate their performance and communicate this information to investors is through their *financial statements*.

Firms issue financial statements regularly to communicate financial information to the investment community. A detailed description of the preparation and analysis of these statements is sufficiently complicated that to do it justice would require an entire book. Here, we briefly review the subject, emphasizing only the material that investors and corporate financial managers need in order to make the corporate-finance decisions we discuss in the text.

We review the four main types of financial statements, present examples of these statements for a firm, and discuss where an investor or manager might find various types of information about the company. We also discuss some of the financial ratios that investors and analysts use to assess a firm's performance and value. We close the chapter with a look at a few highly publicized financial reporting abuses.

2.1 Firms' Disclosure of Financial Information

Financial statements are accounting reports with past performance information that a firm issues periodically (usually quarterly and annually). United States public companies are required to file their financial statements with the U.S. Securities and Exchange Commission (SEC) on a quarterly basis on form **10-Q** and annually on form **10-K**. They must also send an **annual report** with their financial statements to their shareholders each year. Private companies often prepare financial statements as well, but they usually do not have to disclose these reports to the public. Financial statements are important tools through which investors, financial analysts, and other interested outside parties (such as creditors) obtain information about a corporation. They are also useful for managers within the firm as a source of information for corporate financial decisions. In this section, we examine the guidelines for preparing financial statements and introduce the types of financial statements.

Preparation of Financial Statements

Reports about a company's performance must be understandable and accurate. **Generally Accepted Accounting Principles (GAAP)** provide a common set of rules and a standard format for public companies to use when they prepare their reports. This standardization also makes it easier to compare the financial results of different firms.

Investors also need some assurance that the financial statements are prepared accurately. Corporations are required to hire a neutral third party, known as an **auditor**, to check the annual financial statements, to ensure that the annual financial statements are reliable and prepared according to GAAP.

International Financial Reporting Standards

Because Generally Accepted Accounting Principles (GAAP) differ among countries, companies operating internationally face tremendous accounting complexity. Investors also face difficulty interpreting financial statements of foreign companies, which is often considered a major barrier to international capital mobility. As companies and capital markets become more global, however, interest in harmonizing accounting standards across countries has increased.

The most important harmonization project began in 1973 when representatives of 10 countries (including the United States) established the International Accounting Standards Committee. This effort led to the creation of the International Accounting Standards Board (IASB) in 2001, with headquarters in London. Now the IASB has issued a set of International Financial Reporting Standards (IFRS).

The IFRS are taking root throughout the world. The European Union (EU) approved an accounting regulation in 2002 requiring all publicly traded EU companies to follow IFRS in their consolidated financial statements starting in 2005. As of 2022, over 165 jurisdictions either require or permit the use of IFRS, including the EU, Australia, Brazil, Canada, Russia, India, Hong Kong, Taiwan, Japan, and Singapore. China will soon follow suit. Indeed, currently all major stock exchanges around the world accept IFRS except the United States and

China, which maintain their local GAAP. The United States allows foreign registrants to use IFRS standards in their filings.

The main difference between U.S. GAAP and IFRS is conceptual—U.S. GAAP are based primarily on accounting rules with specific guidance in applying them, whereas IFRS are based more on principles requiring professional judgment by accountants, and specific guidance in application is limited. Even so, some differences in rules also exist. For example, U.S. GAAP generally prohibit the upward revaluation of non-financial assets, whereas the IFRS allow the revaluation of some such assets to fair value. U.S. GAAP also rely more heavily on historical cost, as opposed to “fair value,” to estimate the value of assets and liabilities.

Effort to achieve convergence between U.S. GAAP and IFRS was spurred by the Sarbanes-Oxley Act of 2002. It included a provision that U.S. accounting standards move toward international convergence on high-quality accounting standards. Currently SEC regulations still require public U.S. firms to report using U.S. GAAP. And while modifications to both IFRS and U.S. GAAP have brought the two closer together, key differences remain in the treatment of inventory valuation, R&D expenses, impairment charges, and financial instruments. As of early 2022, the SEC looks likely to allow U.S. companies to use IFRS to provide supplemental information, but it will still require them to file their financials in accordance with U.S. GAAP.

Ruth Porat is Senior Vice President and Chief Financial Officer of Alphabet and Google. Previously she spent 27 years at Morgan Stanley, where she last was Executive Vice President and Chief Financial Officer. As Morgan Stanley's Vice Chairman of Investment Banking and Global Head of the Financial Institutions Group, she advised the U.S. Treasury and the New York Federal Reserve Bank.

QUESTION: *What best practices do you recommend for financial managers?*

ANSWER:

1. *Maintain a tight financial control environment with respect to accounting controls and process.* Incorporate a strategic approach to IT architecture to ensure data integrity, consistency, and process controls while reducing reliance on human, manual processes—a source of risk and errors.
2. *Ensure a robust budgeting and capital allocation process built on a strong Financial Planning & Analysis team that is well integrated into the business.* Push data transparency to business leaders. They are best positioned to make difficult tradeoffs in the budgeting process, but often lack data granularity to make those choices (and to see the imperative).
3. *Culture matters.* A culture of honest, frank debate that challenges the status quo and avoids homogeneity of thought makes the job more fun and leads to better results. A broad range of experience, and even some “battle scars,” ensures the organization recognizes patterns to foresee emerging risks. In that regard, a diverse team with respect to gender, race, and socioeconomic background brings differentiated perspectives, contributing to effective risk management.
4. *Make tough calls early and, ideally, once.* Lead.

QUESTION: *How has the crisis shaped the role of the CFO, or your view of it?*

ANSWER: In financial services, it redefined the perception of a CFO. Beyond focusing on accounting and external reporting functions, the CFO is now also the firm's most senior global manager for guardianship and risk management. Guardianship includes accounting (the controller function) and overseeing a comprehensive approach to IT systems. Risk management requires identifying sources of vulnerability, stress testing, and planning against them. The

INTERVIEW WITH RUTH PORAT



CFO has become a trusted adviser to the CEO, board and business leaders, which includes budgeting, capital allocation, and sensitivity analyses. Finally, in certain industries the CFO is the point person with regulators.

QUESTION: *What key lessons did you take from the financial crisis? What advice would you give future CFOs?*

ANSWER: I have three key takeaways from the financial crisis, relevant in both good and bad markets as well as across industries:

1. *Understand your greatest sources of vulnerability and defend against them.* For financial services, liquidity (access to cash) was a weak spot. In that period, we often said, “Liquidity is oxygen for a financial system: without it, you choke.” Without sufficient liquidity, banks were forced into a negative cycle of selling assets to raise cash. As Morgan Stanley's CFO, I managed liquidity with the maxim that it was sacrosanct. We invested substantially in the amount and durability of the company's liquidity reserve. Similarly, regulators coming out of the crisis appropriately demanded higher capital, lower leverage, better liquidity, more durable funding, and rigorous stress testing, which imposed transparency on the banks and exposed their weaknesses.
2. *Build a robust control infrastructure ahead of needs, including financial and risk management controls, systems, and processes.* Just as one shouldn't drive a car at 100 mph with mud on the windshield, business leaders must have visibility about their business from accurate, insightful, and timely data consistent with strong financial controls. Rapid growth industries need to invest in infrastructure early because the business requirements continue to grow so rapidly.
3. *Recognize that time is your enemy.* Treasury Secretary Paulson told me during the financial crisis that you must have the will and the means to solve problems; too often, by the time you have the will, you no longer have the means. He was talking about policy, but that rule applies to any decision maker. The glaring examples, in retrospect, were the clear signs of crisis in August 2007 and the March 2008 collapse of Bear Stearns, but reactions were slow or nonexistent. Even in good times, business leaders must focus on resource optimization to maximize the potential for highest returns on investment.

Types of Financial Statements

Every public company is required to produce four financial statements: the *balance sheet*, the *income statement*, the *statement of cash flows*, and the *statement of stockholders' equity*. These financial statements provide investors and creditors with an overview of the firm's financial performance. In the sections that follow, we take a close look at the content of these financial statements.

CONCEPT CHECK

1. What are the four financial statements that all public companies must produce?
2. What is the role of an auditor?

2.2 The Balance Sheet

The **balance sheet**, or **statement of financial position**,¹ lists the firm's *assets* and *liabilities*, providing a snapshot of the firm's financial position at a given point in time. Table 2.1 shows the balance sheet for a fictitious company, Global Conglomerate Corporation. Notice that the balance sheet is divided into two parts ("sides"), with the assets on the left side and the liabilities on the right. The **assets** list the cash, inventory, property, plant, and equipment, and other investments the company has made; the **liabilities** show the firm's obligations to creditors. Also shown with liabilities on the right side of the balance sheet is

TABLE 2.1

Global Conglomerate Corporation Balance Sheet

GLOBAL CONGLOMERATE CORPORATION					
Consolidated Balance Sheet					
Year Ended December 31 (in \$ million)					
Assets	2022	2021	Liabilities and Stockholders' Equity	2022	2021
Current Assets			Current Liabilities		
Cash	21.2	19.5	Accounts payable	29.2	24.5
Accounts receivable	18.5	13.2	Notes payable/short-term debt	3.5	3.2
Inventories	15.3	14.3	Current maturities of long-term debt	13.3	12.3
Other current assets	2.0	1.0	Other current liabilities	2.0	4.0
Total current assets	57.0	48.0	Total current liabilities	48.0	44.0
Long-Term Assets			Long-Term Liabilities		
Land	22.2	20.7	Long-term debt	99.9	76.3
Buildings	36.5	30.5	Lease obligations	—	—
Equipment	39.7	33.2	Total debt	99.9	76.3
Less accumulated depreciation	(18.7)	(17.5)	Deferred taxes	7.6	7.4
Net property, plant, and equipment	79.7	66.9	Other long-term liabilities	—	—
Goodwill and intangible assets	20.0	20.0	Total long-term liabilities	107.5	83.7
Other long-term assets	21.0	14.0	Total Liabilities	155.5	127.7
Total long-term assets	120.7	100.9	Stockholders' Equity	22.2	21.2
Total Assets	177.7	148.9	Total Liabilities and Stockholders' Equity	177.7	148.9

¹ In IFRS and recent U.S. GAAP pronouncements, the balance sheet is referred to as the *statement of financial position*.

the *stockholders' equity*. **Stockholders' equity**, the difference between the firm's assets and liabilities, is an accounting measure of the firm's net worth.

The assets on the left side show how the firm uses its capital (its investments), and the right side summarizes the sources of capital, or how a firm raises the money it needs. Because of the way stockholders' equity is calculated, the left and right sides must balance:

The Balance Sheet Identity

$$\text{Assets} = \text{Liabilities} + \text{Stockholders' Equity} \quad (2.1)$$

In Table 2.1, total assets for 2022 (\$177.7 million) are equal to total liabilities (\$155.5 million) plus stockholders' equity (\$22.2 million).

Let's examine Global's assets, liabilities, and stockholders' equity in more detail.

Assets

In Table 2.1, Global's assets are divided into current and long-term assets. We discuss each in turn.

Current Assets. **Current assets** are either cash or assets that could be converted into cash within one year. This category includes the following:

1. Cash and other **marketable securities**, which are short-term, low-risk investments that can be easily sold and converted to cash (such as money market investments like government debt that matures within a year);
2. **Accounts receivable**, which are amounts owed to the firm by customers who have purchased goods or services on credit;
3. **Inventories**, which are composed of raw materials as well as work-in-progress and finished goods;
4. Other current assets, which is a catch-all category that includes items such as pre-paid expenses (such as rent or insurance paid in advance).

Long-Term Assets. The first category of **long-term assets** is net property, plant, and equipment. These include assets such as real estate or machinery that produce tangible benefits for more than one year. If Global spends \$2 million on new equipment, this \$2 million will be included with property, plant, and equipment on the balance sheet. Because equipment tends to wear out or become obsolete over time, Global will reduce the value recorded for this equipment each year by deducting a **depreciation expense**. An asset's **accumulated depreciation** is the total amount deducted over its life. The firm reduces the value of fixed assets (other than land) over time according to a depreciation schedule that depends on the asset's life span. Depreciation is not an actual cash expense that the firm pays; it is a way of recognizing that buildings and equipment wear out and thus become less valuable the older they get. The **book value** of an asset, which is the value shown in the firm's financial statements, is equal to its acquisition cost less accumulated depreciation. Net property, plant, and equipment shows the book value of these assets.

When a firm acquires another company, it will acquire a set of tangible assets (such as inventory or property, plant, and equipment) that will then be included on its balance sheet. In many cases, however, the firm may pay more for the company than the total book value of the assets it acquires. In this case, the difference between the price paid for the company and the book value assigned to its tangible assets is recorded separately as **goodwill** and **intangible assets**. For example, Global paid \$25 million in 2020 for a firm whose tangible assets had a book value of \$5 million. The remaining \$20 million appears

as goodwill and intangible assets in Table 2.1. This entry in the balance sheet captures the value of other “intangibles” that the firm acquired through the acquisition (e.g., brand names and trademarks, patents, customer relationships, and employees). If the firm assesses that the value of these intangible assets declined over time, it will reduce the amount listed on the balance sheet by an **amortization** or **impairment charge** that captures the change in value of the acquired assets. Like depreciation, amortization is not an actual cash expense.

Other long-term assets can include such items as property not used in business operations, start-up costs in connection with a new business, investments in long-term securities, and property held for sale. The sum of all the firms’ assets is the total assets at the bottom of the left side of the balance sheet in Table 2.1.

Liabilities

We now examine the liabilities shown on the right side of the balance sheet, which are divided into *current* and *long-term liabilities*.

Current Liabilities. Liabilities that will be satisfied within one year are known as **current liabilities**. They include the following:

1. **Accounts payable**, the amounts owed to suppliers for products or services purchased with credit;
2. **Short-term debt** or notes payable, and current maturities of *long-term debt*, which are all repayments of debt that will occur within the next year;
3. Items such as salary or taxes that are owed but have not yet been paid, and deferred or unearned revenue, which is revenue that has been received for products that have not yet been delivered.

The difference between current assets and current liabilities is the firm’s **net working capital**, the capital available in the short term to run the business. For example, in 2022, Global’s net working capital totaled \$9 million (\$57 million in current assets – \$48 million in current liabilities). Firms with low (or negative) net working capital may face a shortage of funds unless they generate sufficient cash from their ongoing activities.

Long-Term Liabilities. **Long-term liabilities** are liabilities that extend beyond one year. We describe the main types as follows:

1. **Long-term debt** is any loan or debt obligation with a maturity of more than a year. When a firm needs to raise funds to purchase an asset or make an investment, it may borrow those funds through a long-term loan.
2. **Leases** are long-term contracts that obligate the firm to make regular lease payments in exchange for use of an asset.² They allow a firm to gain use of an asset by leasing it from the asset’s owner. For example, a firm may lease a building to serve as its corporate headquarters.
3. **Deferred taxes** are taxes that are owed but have not yet been paid. Firms generally keep two sets of financial statements: one for financial reporting and one for tax purposes. Occasionally, the rules for the two types of statements differ. Deferred tax liabilities generally arise when the firm’s financial income exceeds its income for tax purposes. Because deferred taxes will eventually be paid, they appear as a liability on the balance sheet.³

² See Chapter 25 for a precise definition of, and the accounting treatment for, alternative lease types.

³ A firm may also have deferred tax assets related to tax credits it has earned that it will receive in the future.

Stockholders' Equity

The sum of the current liabilities and long-term liabilities is total liabilities. The difference between the firm's assets and liabilities is the stockholders' equity; it is also called the **book value of equity**. As we stated earlier, it is an accounting measure of the net worth of the firm.

Ideally, the balance sheet would provide us with an accurate assessment of the true value of the firm's equity. Unfortunately, this is unlikely to be the case. First, many of the assets listed on the balance sheet are valued based on their historical cost rather than their true value today. For example, an office building is listed on the balance sheet according to its historical cost net of depreciation. But the actual value of the office building today may be very different (and possibly much *more*) than the amount the firm paid for it years ago. The same is true for other property, plant, and equipment, as well as goodwill: The true value today of an asset may be very different from, and even exceed, its book value. A second, and probably more important, problem is that *many of the firm's valuable assets are not captured on the balance sheet*. Consider, for example, the expertise of the firm's employees, the firm's reputation in the marketplace, the relationships with customers and suppliers, the value of future research and development innovations, and the quality of the management team. These are all assets that add to the value of the firm that do not appear on the balance sheet.

Market Value Versus Book Value

For the reasons cited above, the book value of equity, while accurate from an accounting perspective, is an inaccurate assessment of the true value of the firm's equity. Successful firms are often able to borrow in excess of the book value of their assets because creditors recognize that the market value of the assets is far higher than the book value. Thus, it is not surprising that the book value of equity will often differ substantially from the amount investors are willing to pay for the equity. The total *market* value of a firm's equity equals the number of shares outstanding times the firm's market price per share:

$$\text{Market Value of Equity} = \text{Shares outstanding} \times \text{Market price per share} \quad (2.2)$$

The market value of equity is often referred to as the company's **market capitalization** (or "market cap"). The market value of a stock does not depend on the historical cost of the firm's assets; instead, it depends on what investors expect those assets to produce in the future.

EXAMPLE 2.1

Market Versus Book Value

Problem

If Global has 3.6 million shares outstanding, and these shares are trading for a price of \$14 per share, what is Global's market capitalization? How does the market capitalization compare to Global's book value of equity in 2022?

Solution

Global's market capitalization is $(3.6 \text{ million shares}) \times (\$14/\text{share}) = \$50.4 \text{ million}$. This market capitalization is significantly higher than Global's book value of equity of \$22.2 million. Thus, investors are willing to pay $50.4/22.2 = 2.27$ times the amount Global's shares are "worth" according to their book value.

Market-to-Book Ratio. In Example 2.1, we computed the **market-to-book ratio** (also called the **price-to-book [P/B] ratio**) for Global, which is the ratio of its market capitalization to the book value of stockholders' equity.

$$\text{Market-to-Book Ratio} = \frac{\text{Market Value of Equity}}{\text{Book Value of Equity}} \quad (2.3)$$

The market-to-book ratio for most successful firms substantially exceeds 1, indicating that the value of the firm's assets when put to use exceeds their historical cost. Variations in this ratio reflect differences in fundamental firm characteristics as well as the value added by management.

In mid-2022, the median large U.S. firm had a market-to-book ratio of about 3. Some firms had much higher ratios, such as Pepsico (PEP) with a ratio of 13 and Tesla (TSLA) with a ratio of 21. In contrast, Ford Motor Company (F) had a market-to-book ratio of 1.0, and American International Group (AIG) had a market-to-book ratio of only 0.7. The fact that AIG's ratio is below 1.0 reflects investors' assessment that many of AIG's assets (such as mortgage bonds it acquired prior to the financial crisis) are worth far less than their book value. Analysts often classify firms with low market-to-book ratios as **value stocks**, and those with high market-to-book ratios as **growth stocks**.

Enterprise Value

A firm's market capitalization measures the market value of the firm's equity, or the value that remains after the firm has paid its debts. But what is the value of the business itself? The **enterprise value** of a firm (also called the **total enterprise value** or **TEV**) assesses the value of the underlying business assets, unencumbered by debt and separate from any cash and marketable securities. We compute it as follows:

$$\text{Enterprise Value} = \text{Market Value of Equity} + \text{Debt} - \text{Cash} \quad (2.4)$$

From Example 2.1, Global's market capitalization in 2022 is \$50.4 million. Its debt is \$116.7 million (\$3.5 million of notes payable, \$13.3 million of current maturities of long-term debt, and remaining long-term debt of \$99.9 million). Therefore, given its cash balance of \$21.2 million, Global's enterprise value is $50.4 + 116.7 - 21.2 = \$145.9$ million. The enterprise value can be interpreted as the cost to take over the business. That is, it would cost $50.4 + 116.7 = \$167.1$ million to buy all of Global's equity and pay off its debts, but because we would acquire Global's \$21.2 million in cash, the net cost of the business is only $167.1 - 21.2 = \$145.9$ million.⁴

CONCEPT CHECK

1. What is the balance sheet identity?
2. The book value of a company's assets usually does not equal the market value of those assets. What are some reasons for this difference?
3. What is a firm's enterprise value, and what does it measure?

2.3 The Income Statement

When you want somebody to get to the point, you might ask him or her for the "bottom line." This expression comes from the *income statement*. The **income statement** or **statement of financial performance**⁵ lists the firm's revenues and expenses over a period of

⁴ If the firm has subsidiaries that are fully represented in its financial statements but not wholly owned, we add the value of the unowned portion, called minority interest, to the enterprise value—to own the whole business, you would need to buy out these minority stakeholders. Also, because the firm may need some cash simply to operate, it is most precise to subtract only *excess* cash when computing enterprise value.

⁵ In IFRS and recent U.S. GAAP pronouncements, the income statement is referred to as the *statement of financial performance*.

time. The last or “bottom” line of the income statement shows the firm’s **net income**, which is a measure of its profitability during the period. The income statement is sometimes called a profit and loss, or “P&L” statement, and the net income is also referred to as the firm’s **earnings**. In this section, we examine the components of the income statement in detail and introduce ratios we can use to analyze this data.

Earnings Calculations

Whereas the balance sheet shows the firm’s assets and liabilities at a given point in time, the income statement shows the flow of revenues and expenses generated by those assets and liabilities between two dates. Table 2.2 shows Global’s income statement for 2022. We examine each category on the statement.

Gross Profit. The first two lines of the income statement list the revenues from sales of products and the costs incurred to make and sell the products. Cost of sales shows costs directly related to producing the goods or services being sold, such as manufacturing costs. Other costs such as administrative expenses, research and development, and interest expenses are not included in the cost of sales. The third line is **gross profit**, which is the difference between sales revenues and the costs.

Operating Expenses. The next group of items is operating expenses. These are expenses from the ordinary course of running the business that are not directly related to producing the goods or services being sold. They include administrative expenses and overhead, salaries, marketing costs, and research and development expenses. The third type of operating expense, depreciation and amortization, is not an actual cash expense but represents an

TABLE 2.2

Global Conglomerate Corporation Income Statement Sheet

GLOBAL CONGLOMERATE CORPORATION		
Income Statement		
Year Ended December 31 (in \$ million)		
	2022	2021
Total sales	186.7	176.1
Cost of sales	(153.4)	(147.3)
Gross Profit	33.3	28.8
Selling, general, and administrative expenses	(13.5)	(13.0)
Research and development	(8.2)	(7.6)
Depreciation and amortization	(1.2)	(1.1)
Operating Income	10.4	7.1
Other income	—	—
Earnings Before Interest and Taxes (EBIT)	10.4	7.1
Interest income (expense)	(7.7)	(4.6)
Pretax Income	2.7	2.5
Taxes	(0.7)	(0.6)
Net Income	2.0	1.9
Earnings per share:	\$0.556	\$0.528
Diluted earnings per share:	\$0.526	\$0.500

estimate of the costs that arise from wear and tear or obsolescence of the firm's assets.⁶ The firm's gross profit net of operating expenses is called **operating income**.

Earnings before Interest and Taxes. We next include other sources of income or expenses that arise from activities that are not the central part of a company's business. Income from the firm's financial investments is one example of other income that would be listed here. After we have adjusted for other sources of income or expenses, we have the firm's earnings before interest and taxes, or **EBIT**.

Pretax and Net Income. From EBIT, we deduct the interest expense related to outstanding debt to compute Global's pretax income, and then we deduct corporate taxes to determine the firm's net income.

Net income represents the total earnings of the firm's equity holders. It is often reported on a per-share basis as the firm's **earnings per share (EPS)**, which we compute by dividing net income by the total number of shares outstanding:

$$\text{EPS} = \frac{\text{Net Income}}{\text{Shares Outstanding}} = \frac{\$2.0 \text{ Million}}{3.6 \text{ Million Shares}} = \$0.556 \text{ per Share} \quad (2.5)$$

Although Global has only 3.6 million shares outstanding as of the end of 2022, the number of shares outstanding may grow if Global compensates employees with grants of stock or **stock options** that give the holder the right to buy a certain number of shares by a specific date at a specific price. If the options are “exercised,” the company issues new stock and the number of shares outstanding will grow. The number of shares may also grow if the firm issues **convertible bonds**, a form of debt that can be converted to shares. Because there will be more total shares to divide the same earnings, this growth in the number of shares is referred to as **dilution**. Firms disclose the potential for dilution by reporting **diluted EPS**, which computes earnings per share as though any in-the-money stock options, stock grants, or dilutive convertible debt had already been exercised or converted. For example, in 2021, Global granted 200,000 shares of restricted stock units (RSUs) to its key executives. While these are currently unvested, they will ultimately increase the number of shares outstanding, so Global's diluted EPS is \$2 million/(3.6 + 0.2) million shares = \$0.526.⁷

CONCEPT CHECK

1. What is the difference between a firm's gross profit and its net income?
2. What is the diluted earnings per share?

2.4 The Statement of Cash Flows

The income statement provides a measure of the firm's profit over a given time period. However, it does not indicate the amount of *cash* the firm has generated. There are two reasons that net income does not correspond to cash earned. First, there are non-cash entries

⁶ Only certain types of amortization are deductible as a pretax expense (e.g., amortization of the cost of an acquired patent). Also, firms often do not separately list depreciation and amortization on the income statement, but rather include them with the expenses by function (e.g., depreciation of R&D equipment would be included with R&D expenses). When depreciation and amortization has been separated in this way, practitioners often refer to the expense items as “clean” (e.g., “clean R&D” is R&D expenses excluding any depreciation or amortization).

⁷ RSUs are promises to award shares of stock in the future, and are added directly to the diluted share count. For options, the diluted share count is typically calculated using the *treasury stock method*, in which the number of shares added has the same value as the profit from exercising the option. For example, given Global's share price of \$14 per share, an option giving an employee the right to purchase a share for \$7 would add $(\$14 - \$7)/\$14 = 0.5$ shares to the diluted share count.

on the income statement, such as depreciation and amortization. Second, certain uses of cash, such as the purchase of a building or expenditures on inventory, are not reported on the income statement. The firm's **statement of cash flows** utilizes the information from the income statement and balance sheet to determine how much cash the firm has generated, and how that cash has been allocated, during a set period. As we will see, from the perspective of an investor attempting to value the firm, the statement of cash flows provides what may be the most important information of the four financial statements.

The statement of cash flows is divided into three sections: operating activities, investment activities, and financing activities. The first section, operating activity, starts with net income from the income statement. It then adjusts this number by adding back all non-cash entries related to the firm's operating activities. The next section, investment activity, lists the cash used for investment. The third section, financing activity, shows the flow of cash between the firm and its investors. Global Conglomerate's statement of cash flows is shown in Table 2.3. In this section, we take a close look at each component of the statement of cash flows.

Operating Activity

The first section of Global's statement of cash flows adjusts net income by all non-cash items related to operating activity. For instance, depreciation is deducted when computing net income, but it is not an actual cash outflow. Thus, we add it back to net income when determining

TABLE 2.3**Global Conglomerate Corporation Statement of Cash Flows**

GLOBAL CONGLOMERATE CORPORATION		
Statement of Cash Flows		
Year Ended December 31 (in \$ million)		
	2022	2021
Operating activities		
Net income	2.0	1.9
Depreciation and amortization	1.2	1.1
Other non-cash items	0.2	1.0
Cash effect of changes in		
Accounts receivable	(5.3)	(0.3)
Accounts payable	4.7	(0.5)
Inventory	(1.0)	(1.0)
Other net operating assets	(3.0)	(2.0)
Cash from operating activities	(1.2)	0.2
Investment activities		
Capital expenditures	(14.0)	(4.0)
Acquisitions and other investing activity	(7.0)	(2.0)
Cash from investing activities	(21.0)	(6.0)
Financing activities		
Dividends paid	(1.0)	(1.0)
Sale (or purchase) of stock	—	—
Increase in borrowing	24.9	5.5
Cash from financing activities	23.9	4.5
Change in cash and cash equivalents	1.7	(1.3)

the amount of cash the firm has generated. Similarly, we add back any other non-cash expenses (such as stock-based compensation expenses or increases in deferred taxes).

Next, we adjust for changes to net working capital that arise from changes to accounts receivable, accounts payable, or inventory. When a firm sells a product, it records the revenue as income even though it may not receive the cash from that sale immediately. Instead, it may grant the customer credit and let the customer pay in the future. The customer's obligation adds to the firm's accounts receivable. We use the following guidelines to adjust for changes in working capital:

1. *Accounts Receivable*: When a sale is recorded as part of net income, but the cash has not yet been received from the customer, we must adjust the cash flows by *deducting* the increases in accounts receivable. This increase represents additional lending by the firm to its customers, and it reduces the cash available to the firm.
2. *Accounts Payable*: Conversely, we *add* increases in accounts payable. Accounts payable represents borrowing by the firm from its suppliers. This borrowing increases the cash available to the firm.
3. *Inventory*: Next, we *deduct* increases to inventory. Increases to inventory are not recorded as an expense and do not contribute to net income (the cost of the goods are only included in net income when the goods are actually sold). However, the cost of increasing inventory is a cash expense for the firm and must be deducted.
4. *Other*: Finally, we deduct the increase in any other current assets net of liabilities, *excluding cash and debt*.

We can identify the changes in these working capital items from the balance sheet. For example, from Table 2.1, Global's accounts receivable increased from \$13.2 million in 2021 to \$18.5 million in 2022. We deduct the increase of $18.5 - 13.2 = \$5.3$ million on the statement of cash flows. Note that although Global showed positive net income on the income statement, it actually had a negative \$1.2 million cash flow from operating activity, in large part because of the increase in accounts receivable.

Investment Activity

The next section of the statement of cash flows shows the cash required for investment activities. Purchases of new property, plant, and equipment are referred to as **capital expenditures**. Recall that capital expenditures do not appear immediately as expenses on the income statement. Instead, firms recognize these expenditures over time as depreciation expenses. To determine the firm's cash flow, we already added back depreciation because it is not an actual cash outflow. Now, we subtract the actual capital expenditure that the firm made. Similarly, we also deduct other assets purchased or long-term investments made by the firm, such as acquisitions or purchases of marketable securities. In Table 2.3, we see that in 2022, Global spent \$21 million in cash on investing activities.

Financing Activity

The last section of the statement of cash flows shows the cash flows from financing activities. Dividends paid to shareholders are a cash outflow. Global paid \$1 million to its shareholders as dividends in 2022. The difference between a firm's net income and the amount it spends on dividends is referred to as the firm's **retained earnings** for that year:

$$\text{Retained Earnings} = \text{Net Income} - \text{Dividends} \quad (2.6)$$

Global retained \$2 million – \$1 million = \$1 million, or 50% of its earnings in 2022.

Also listed under financing activity is any cash the company received from the sale of its own stock, or cash spent buying (repurchasing) its own stock. Global did not issue or repurchase stock during this period. The last items to include in this section result from changes to Global's short-term and long-term borrowing. Global raised money by issuing debt, so the increases in borrowing represent cash inflows.

The final line of the statement of cash flows combines the cash flows from these three activities to calculate the overall change in the firm's cash balance over the period of the statement. In this case, Global had cash inflows of \$1.7 million, which matches the change in cash from 2021 to 2022 shown earlier in the balance sheet. By looking at the statement in Table 2.3 as a whole, we can determine that Global chose to borrow to cover the cost of its investment and operating activities. Although the firm's cash balance has increased, Global's negative operating cash flows and relatively high expenditures on investment activities might give investors some reasons for concern. If that pattern continues, Global will need to raise capital, by continuing to borrow or issuing equity, to remain in business.

EXAMPLE 2.2

The Impact of Depreciation on Cash Flow

Problem

Suppose Global had an additional \$1 million depreciation expense in 2022. If Global's tax rate on pretax income is 26%, what would be the impact of this expense on Global's earnings? How would it impact Global's cash balance at the end of the year?

Solution

Depreciation is an operating expense, so Global's operating income, EBIT, and pretax income would fall by \$1 million. This decrease in pretax income would reduce Global's tax bill by $26\% \times \$1 \text{ million} = \0.26 million . Therefore, net income would fall by $1 - 0.26 = \$0.74 \text{ million}$.

On the statement of cash flows, net income would fall by \$0.74 million, but we would add back the additional depreciation of \$1 million because it is not a cash expense. Thus, cash from operating activities would rise by $-0.74 + 1 = \$0.26 \text{ million}$. Thus, Global's cash balance at the end of the year would increase by \$0.26 million, the amount of the tax savings that resulted from the additional depreciation expense.

CONCEPT CHECK

1. Why does a firm's net income not correspond to cash generated?
2. What are the components of the statement of cash flows?

2.5 Other Financial Statement Information

The most important elements of a firm's financial statements are the balance sheet, income statement, and the statement of cash flows, which we have already discussed. Several other pieces of information contained in the financial statements warrant brief mention: the statement of stockholders' equity, the management discussion and analysis, and notes to the financial statements.

Statement of Stockholders' Equity

The **statement of stockholders' equity** breaks down the stockholders' equity computed on the balance sheet into the amount that came from issuing shares (par value plus paid-in capital) versus retained earnings. Because the book value of stockholders' equity is not a useful assessment of value for financial purposes, financial managers use the statement of stockholders' equity infrequently (so we will skip the computational details here). We can,

however, determine the change in stockholders' equity using information from the firm's other financial statements as follows:⁸

$$\begin{aligned}\text{Change in Stockholders' Equity} &= \text{Retained Earnings} + \text{Net sales of stock} \\ &= \text{Net Income} - \text{Dividends} + \\ &\quad \text{Sales of stock} - \text{Repurchases of stock} \quad (2.7)\end{aligned}$$

For example, because Global had no stock sales or repurchases, its stockholders' equity increased by the amount of its retained earnings, or \$1.0 million, in 2022. Note that this result matches the change in stockholders' equity shown earlier on Global's balance sheet.

Management Discussion and Analysis

The **management discussion and analysis (MD&A)** is a preface to the financial statements in which the company's management discusses the recent year (or quarter), providing a background on the company and any significant events that may have occurred. Management may also discuss the coming year, and outline goals, new projects, and future plans.

Management should also discuss any important risks that the firm faces or issues that may affect the firm's liquidity or resources. Management is also required to disclose any **off-balance sheet transactions**, which are transactions or arrangements that can have a material impact on the firm's future performance yet do not appear on the balance sheet. For example, if a firm has made guarantees that it will compensate a buyer for losses related to an asset purchased from the firm, these guarantees represent a potential future liability for the firm that must be disclosed as part of the MD&A.

Notes to the Financial Statements

In addition to the four financial statements, companies provide extensive notes with further details on the information provided in the statements. For example, the notes document important accounting assumptions that were used in preparing the statements. They often provide information specific to a firm's subsidiaries or its separate product lines. They show the details of the firm's stock-based compensation plans for employees and the different types of debt the firm has outstanding. Details of acquisitions, spin-offs, leases, taxes, debt repayment schedules, and risk management activities are also given. The information provided in the notes is often very important to interpret fully the firm's financial statements.

EXAMPLE 2.3

Sales by Product Category

Problem

In 2021, Hormel Foods Corp (HRL) reported the following sales revenues by reportable segment/product category (\$ million):

	2021	2020
Grocery Products	\$2,809	\$2,385
Refrigerated Foods	6,333	5,271
Jennie-O Turkey Store	1,495	1,333
International & Other	748	618

Which category showed the highest percentage growth? If Hormel has the same percentage growth by category from 2021 to 2022, what will its total revenues be in 2022?

⁸ Sales of stock would also include any stock-based compensation.

Solution

The percentage growth in the sales of grocery products was $2809/2385 - 1 = 17.8\%$. Similarly, growth in Refrigerated Foods was 20.1% and the Jennie-O Turkey Store grew by 12.2%. Hormel's highest growth category was International & Other at $748/618 - 1 = 21.0\%$.

If these growth rates continue for another year, sales of Grocery Products will be $2809 \times 1.178 = \$3309$ million, and the other categories will be \$7609 million, \$1677 million, and \$905 million, respectively, for total revenues of \$13.5 billion, an 18.6% increase from 2021.

CONCEPT CHECK

1. Where do off-balance sheet transactions appear in a firm's financial statements?
2. What information do the notes to financial statements provide?

2.6 Financial Statement Analysis

Investors often use accounting statements to evaluate a firm in one of two ways:

1. Compare the firm with itself by analyzing how the firm has changed over time.
2. Compare the firm to other similar firms using a common set of financial ratios.

In this section we will describe the most commonly used ratios—related to profitability, liquidity, working capital, interest coverage, leverage, valuation, and operating returns—and explain how each one is used in practice.

Profitability Ratios

The income statement provides very useful information regarding the profitability of a firm's business and how it relates to the value of the firm's shares. The **gross margin** of a firm is the ratio of gross profit to revenues (sales):

$$\text{Gross Margin} = \frac{\text{Gross Profit}}{\text{Sales}} \quad (2.8)$$

A firm's gross margin reflects its ability to sell a product for more than the cost of producing it. For example, in 2022, Global had gross margin of $33.3/186.7 = 17.8\%$.

Because there are additional expenses of operating a business beyond the direct costs of goods sold, another important profitability ratio is the **operating margin**, the ratio of operating income to revenues:

$$\text{Operating Margin} = \frac{\text{Operating Income}}{\text{Sales}} \quad (2.9)$$

The operating margin reveals how much a company earns before interest and taxes from each dollar of sales. In 2022, Global's operating margin was $10.4/186.7 = 5.57\%$, an increase from its 2021 operating margin of $7.1/176.1 = 4.03\%$. We can similarly compute a firm's **EBIT margin** = (EBIT/Sales).

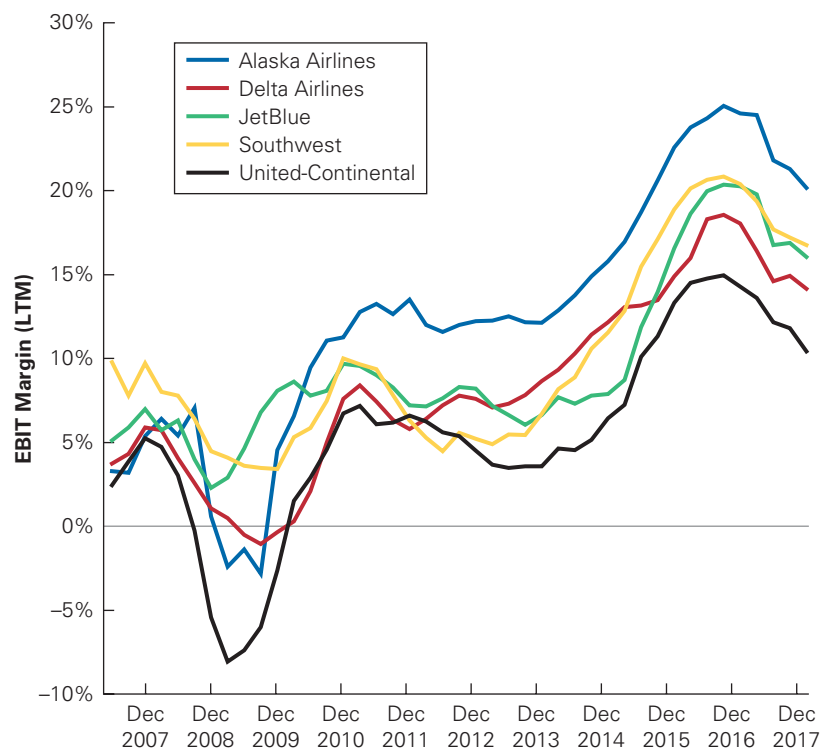
By comparing operating or EBIT margins across firms within an industry, we can assess the relative efficiency of the firms' operations. For example, Figure 2.1 compares the EBIT margins of five major U.S. airlines from 2007 to 2021. Notice the impact on profitability from the financial crisis during 2008–2009, as well as the consistently low profits of the largest and oldest of the carriers, United-Continental (UAL), relative to its competitors.

FIGURE 2.1

EBIT Margins for Five U.S. Airlines

Annual (last twelve month) EBIT margins for five U.S. airlines: Alaska Airlines, Delta Airlines, JetBlue, Southwest, and United-Continental. Note the decline in profitability for all airlines in the wake of the 2008 financial crisis, followed by a recovery by mid-2010. Note also the consistently lower profitability of the legacy carrier, United-Continental, relative to its younger peers.

Source: Capital IQ



In addition to the efficiency of operations, differences in profitability can result from corporate strategy. For example, in 2021, high-end retailer Lululemon (LULU) had an EBIT margin of 22%; Walmart (WMT) had an EBIT margin of only 4.5%. In this case, Walmart's lower operating margin was not a result of its inefficiency. Rather, the low operating margin is part of Walmart's strategy of offering low prices to sell common products in high volume. Indeed, Walmart's sales were over 90 times higher than those of Lululemon.

Finally, a firm's **net profit margin** is the ratio of net income to revenues:

$$\text{Net Profit Margin} = \frac{\text{Net Income}}{\text{Sales}} \quad (2.10)$$

The net profit margin shows the fraction of each dollar in revenues that is available to equity holders after the firm pays interest and taxes. In 2022, Global's net profit margin was $2.0/186.7 = 1.07\%$. One must be cautious when comparing net profit margins: While differences in net profit margins can be due to differences in efficiency, they can also result from differences in leverage, which determines the amount of interest expense, as well as differences in accounting assumptions.

Liquidity Ratios

Financial analysts often use the information in the firm's balance sheet to assess its financial solvency or liquidity. Specifically, creditors often compare a firm's current assets and current

liabilities to assess whether the firm has sufficient working capital to meet its short-term needs. This comparison can be summarized in the firm's **current ratio**, the ratio of current assets to current liabilities:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Notice that Global's current ratio increased from $48/44 = 1.09$ in 2021 to $57/48 = 1.19$ in 2022.

A more stringent test of the firm's liquidity is the **quick ratio**, which compares only cash and "near cash" assets, such as short-term investments and accounts receivable, to current liabilities. In 2022, Global's quick ratio was $(21.2 + 18.5)/48 = 0.83$. A higher current or quick ratio implies less risk of the firm experiencing a cash shortfall in the near future. A reason to exclude inventory is that it may not be that liquid; indeed an increase in the current ratio that results from an unusual increase in inventory could be an indicator that the firm is having difficulty selling its products.

Ultimately, firms need cash to pay employees and meet other obligations. Running out of cash can be very costly for a firm, so firms often gauge their cash position by calculating the **cash ratio**, which is the most stringent liquidity ratio:

$$\text{Cash Ratio} = \frac{\text{Cash}}{\text{Current Liabilities}}$$

Of course, all of these liquidity ratios are limited in that they only consider the firm's current assets. If the firm is able to generate significant cash quickly from its ongoing activities, it might be highly liquid even if these ratios are poor.

EXAMPLE 2.4

Computing Liquidity Ratios

Problem

Calculate Global's quick ratio and cash ratio. Based on these measures, how has its liquidity changed between 2021 and 2022?

Solution

In 2021, Global's quick ratio was $(19.5 + 13.2)/44 = 0.74$ and its cash ratio was $19.5/44 = 0.44$. In 2022, these ratios were 0.83 and $21.2/48 = 0.44$, respectively. Thus, Global's cash ratio remained stable over this period, while its quick ratio improved slightly. But although these liquidity measures have not deteriorated, their low level combined with Global's ongoing negative cash flow from operating and investing activities, shown in the statement of cash flows, may be a cause for investor concern.

Working Capital Ratios

We can use the combined information in the firm's income statement and balance sheet to gauge how efficiently the firm is utilizing its net working capital. To evaluate the speed at which a company turns sales into cash, firms often compute the number of

accounts receivable days—that is, the number of days' worth of sales accounts receivable represents:⁹

$$\text{Accounts Receivable Days} = \frac{\text{Accounts Receivable}}{\text{Average Daily Sales}} \quad (2.11)$$

Given average daily sales of \$186.7 million/365 = \$0.51 million in 2022, Global's receivables of \$18.5 million represent $18.5/0.51 = 36$ days' worth of sales. In other words, on average, Global takes a little over one month to collect payment from its customers. In 2021, Global's accounts receivable represented only 27 days' worth of sales. Although the number of receivable days can fluctuate seasonally, a significant unexplained increase could be a cause for concern (perhaps indicating the firm is doing a poor job of collecting from its customers or is trying to boost sales by offering generous credit terms).

There are similar ratios for accounts payable and inventory. For these items, it is natural to compare them to the firm's cost of sales, which should reflect the total amount paid to suppliers and inventory sold. Therefore, **accounts payable days** is defined as:

$$\text{Accounts Payable Days} = \frac{\text{Accounts Payable}}{\text{Average Daily Cost of Sales}} \quad (2.12)$$

Similarly, **inventory days** = (inventory/average daily cost of sales).¹⁰

Turnover ratios are an alternative way to measure working capital. We compute turnover ratios by expressing annual revenues or costs as a multiple of the corresponding working capital account. For example,

$$\text{Inventory Turnover} = \frac{\text{Annual Cost of Sales}}{\text{Inventory}} \quad (2.13)$$

Global's **inventory turnover** in 2022 is $153.4/15.3 = 10.0\times$, indicating that Global sold roughly 10 times its current stock of inventory during the year. Similarly, **accounts receivable turnover** = (annual sales/accounts receivable) and **accounts payable turnover** = (annual cost of sales/accounts payable). Note that higher turnover corresponds to shorter days, and thus a more efficient use of working capital.

While working capital ratios can be meaningfully compared over time or within an industry, there are wide differences across industries. For instance, though the median large U.S. firm had about 49 days' worth of receivables and 61 days' worth of inventory in 2022, airlines tend to have minimal accounts receivable or inventory, as their customers pay in advance and they sell a transportation service as opposed to a physical commodity. On the other hand, distillers and wine producers tend to have very large inventory (over 200 days on average), as their products are often aged prior to sale.

Interest Coverage Ratios

Lenders often assess a firm's ability to meet its interest obligations by comparing its earnings with its interest expenses using an **interest coverage ratio**. One common ratio to consider is the firm's EBIT as a multiple of its interest expenses. A high ratio indicates that the firm is earning much more than is necessary to meet its required interest payments.

⁹ Accounts receivable days can also be calculated based on the *average* accounts receivable at the end of the current and prior year.

¹⁰ As with accounts receivable days, these ratios can also be calculated using the average accounts payable or inventory balance from the current and prior year.

As a benchmark, creditors often look for an EBIT/Interest coverage ratio in excess of $5\times$ for high-quality borrowers. When EBIT/Interest falls below 1.5, lenders may begin to question a company's ability to repay its debts.

Depreciation and amortization expenses are deducted when computing EBIT, but they are not actually cash expenses for the firm. Consequently, financial analysts often compute a firm's earnings before interest, taxes, depreciation, and amortization, or **EBITDA**, as a measure of the cash a firm generates from its operations and has available to make interest payments:¹¹

$$\text{EBITDA} = \text{EBIT} + \text{Depreciation and Amortization} \quad (2.14)$$

We can similarly compute the firm's EBITDA/Interest coverage ratio.

EXAMPLE 2.5

Computing Interest Coverage Ratios

Problem

Assess Global's ability to meet its interest obligations by calculating interest coverage ratios using both EBIT and EBITDA.

Solution

In 2021 and 2022, Global had the following interest coverage ratios:

$$\begin{aligned} 2021: \quad \frac{\text{EBIT}}{\text{Interest}} &= \frac{7.1}{4.6} = 1.54 \quad \text{and} \quad \frac{\text{EBITDA}}{\text{Interest}} = \frac{7.1 + 1.1}{4.6} = 1.78 \\ 2022: \quad \frac{\text{EBIT}}{\text{Interest}} &= \frac{10.4}{7.7} = 1.35 \quad \text{and} \quad \frac{\text{EBITDA}}{\text{Interest}} = \frac{10.4 + 1.2}{7.7} = 1.51 \end{aligned}$$

In this case Global's low—and declining—interest coverage could be a source of concern for its creditors.

Leverage Ratios

An important piece of information that we can learn from a firm's balance sheet is the firm's **leverage**, or the extent to which it relies on debt as a source of financing. The **debt-equity ratio** is a common ratio used to assess a firm's leverage. We calculate this ratio by dividing the total amount of short- and long-term debt (including current maturities) by the total stockholders' equity:

$$\text{Debt-Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}} \quad (2.15)$$

We can calculate the debt-equity ratio using either book or market values for equity and debt. From Table 2.1, Global's debt in 2022 includes notes payable (\$3.5 million), current

¹¹ Because firms often do not separately list depreciation and amortization expenses on the income statement, EBITDA is generally calculated by combining EBIT from the income statement and depreciation and amortization from the statement of cash flows. Note also that because the firm may ultimately need to invest to replace depreciating assets, EBITDA is best viewed as a measure of the firm's *short-run* ability to meet interest payments.

maturities of long-term debt (\$13.3 million), and long-term debt (\$99.9 million), for a total of \$116.7 million. Therefore, its *book* debt-equity ratio is $116.7/22.2 = 5.3$, using the book value of equity. Note the increase from 2021, when the book debt-equity ratio was only $(3.2 + 12.3 + 76.3)/21.2 = 91.8/21.2 = 4.3$.

Because of the difficulty interpreting the book value of equity, the book debt-equity ratio is not especially useful. Indeed, the book value of equity might even be negative, making the ratio meaningless. For example, Domino's Pizza (DPZ) has, based on the strength of its cash flow, consistently borrowed in excess of the book value of its assets. In 2021, Domino's had net operating assets of \$785 million. But it had \$4.9 billion in debt outstanding, and thus its equity book value was $-\$4.2$ billion!

It is therefore most informative to compare the firm's debt to the market value of its equity. Recall from Example 2.1 that in 2022, the total market value of Global's equity, its market capitalization, is $3.6 \text{ million shares} \times \$14/\text{share} = \$50.4$ million. Therefore, Global's *market* debt-equity ratio in 2022 is $116.7/50.4 = 2.3$, which means Global's debt is a bit more than double the market value of its equity.¹² As we show later in the text, a firm's market debt-equity ratio has important consequences for the risk and return of its stock.

We can also calculate the fraction of the firm financed by debt in terms of its **debt-to-capital ratio**:

$$\text{Debt-to-Capital Ratio} = \frac{\text{Total Debt}}{\text{Total Equity} + \text{Total Debt}} \quad (2.16)$$

Again, this ratio can be computed using book or market values.

While leverage increases the risk to the firm's equity holders, firms may also hold cash reserves in order to reduce risk. Thus, another useful measure to consider is the firm's **net debt**, or debt in excess of its cash reserves:¹³

$$\text{Net Debt} = \text{Total Debt} - \text{Cash \& Short-term Investments} \quad (2.17)$$

To understand why net debt may be a more relevant measure of leverage, consider a firm with more cash than debt outstanding: Because such a firm could pay off its debts immediately using its available cash, it has not increased its risk and has no effective leverage.

Analogous to the debt-to-capital ratio, we can use the concept of net debt to compute the firm's **debt-to-enterprise value ratio**:

$$\begin{aligned} \text{Debt-to-Enterprise Value Ratio} &= \frac{\text{Net Debt}}{\text{Market Value of Equity} + \text{Net Debt}} \\ &= \frac{\text{Net Debt}}{\text{Enterprise Value}} \end{aligned} \quad (2.18)$$

Given Global's 2022 cash balance of \$21.2 million, and total long- and short-term debt of \$116.7 million, its net debt is $116.7 - 21.2 = \$95.5$ million. Given its market value of equity

¹² In this calculation, we have compared the market value of equity to the book value of debt. Strictly speaking, it would be best to use the market value of debt. But because the market value of debt is generally not very different from its book value, this distinction is often ignored in practice.

¹³ While net debt should ideally be calculated by deducting cash in excess of the firm's operating needs, absent additional information, it is typical in practice to deduct all cash on the balance sheet.

of \$50.4 million, Global's enterprise value in 2022 is $50.4 + 95.5 = \$145.9$ million, and thus its debt-to-enterprise value ratio is $95.5/145.9 = 65.5\%$. That is, 65.5% of Global's underlying business activity is financed via debt.

A final measure of leverage is a firm's **equity multiplier**, measured in book value terms as Total Assets/Book Value of Equity. As we will see shortly, this measure captures the amplification of the firm's accounting returns that results from leverage. The market value equity multiplier, which is generally measured as Enterprise Value/Market Value of Equity, indicates the amplification of shareholders' financial risk that results from leverage.

Valuation Ratios

Analysts use a number of ratios to gauge the market value of the firm. The most common is the firm's **price-earnings ratio (P/E)**:

$$\text{P/E Ratio} = \frac{\text{Market Capitalization}}{\text{Net Income}} = \frac{\text{Share Price}}{\text{Earnings per Share}} \quad (2.19)$$

That is, the P/E ratio is the ratio of the value of equity to the firm's earnings, either on a total basis or on a per-share basis. For example, Global's P/E ratio in 2022 was $50.4/2.0 = 14/0.556 = 25.2$. In other words, investors are willing to pay over 25 times Global's earnings to purchase a share.

The P/E ratio is a simple measure that is used to assess whether a stock is over- or under-valued based on the idea that the value of a stock should be proportional to the level of earnings it can generate for its shareholders. P/E ratios can vary widely across industries and tend to be highest for industries with high expected growth rates. For example, in early 2022, the median large U.S. firm had a P/E ratio of about 19. But software firms, which tend to have above-average growth rates, had an average P/E ratio of 37, while iron and steel firms, which have experienced slower growth, had an average P/E ratio of about 4. The risk of the firm will also affect this ratio—all else equal, riskier firms have lower P/E ratios.

Because the P/E ratio considers the value of the firm's equity, it is sensitive to the firm's choice of leverage. The P/E ratio is therefore of limited usefulness when comparing firms with markedly different leverage. We can avoid this limitation by instead assessing the market value of the underlying business using valuation ratios based on the firm's enterprise value. Common ratios include the ratio of enterprise value to revenue, or enterprise value to operating income, EBIT, or EBITDA. These ratios compare the value of the business to its sales, operating profits, or cash flow. Like the P/E ratio, these ratios are used to make intra-industry comparisons of how firms are priced in the market.

COMMON MISTAKE Mismatched Ratios

When considering valuation (and other) ratios, be sure that the items you are comparing both represent amounts related to the entire firm or that both represent amounts related solely to equity holders. For example, a firm's share price and market capitalization are values associated with the firm's equity. Thus, it makes sense to compare them to the firm's earnings per share or net income, which are amounts to equity holders

after interest has been paid to debt holders. We must be careful, however, if we compare a firm's market capitalization to its revenues, operating income, or EBITDA because these amounts are related to the whole firm, and both debt and equity holders have a claim to them. Thus, it is better to compare revenues, operating income, or EBITDA to the enterprise value of the firm, which includes both debt and equity.

EXAMPLE 2.6**Computing Profitability and Valuation Ratios****Problem**

Consider the following data as of March 2022 for Walmart and Target Corporation (in \$ billion):

	WMT	TGT
Sales	572.8	106.0
EBIT	25.9	9.1
Depreciation and Amortization	10.7	2.6
Net Income	13.7	6.9
Market Capitalization	390.6	100.2
Cash	14.8	5.9
Debt	43.9	13.7

Compare Walmart's and Target's EBIT margins, net profit margins, P/E ratios, and the ratio of enterprise value to sales, EBIT, and EBITDA.

Solution

Walmart had an EBIT Margin of $25.9/572.8 = 4.5\%$, a net profit margin of $13.7/572.8 = 2.4\%$, and a P/E ratio of $390.6/13.7 = 28.5$. Its enterprise value was $390.6 + 43.9 - 14.8 = \$419.7$ billion, which has a ratio of $419.7/572.8 = 0.73$ to sales, $419.7/25.9 = 16.2$ to EBIT, and $419.7/(25.9 + 10.7) = 11.5$ to EBITDA.

Target had an EBIT margin of $9.1/106 = 8.6\%$, a net profit margin of $6.9/106 = 6.5\%$, and a P/E ratio of $100.2/6.9 = 14.5$. Its enterprise value was $100.2 + 13.7 - 5.9 = \$108$ billion, which has a ratio of $108.0/106 = 1.0$ to sales, $108/9.1 = 11.9$ to EBIT, and $108/(9.1 + 2.6) = 9.2$ to EBITDA.

Note that despite the large difference in the size of the two firms, their valuation multiples are comparable. Walmart trades at a higher earnings multiple, whereas Target trades at a higher multiple of sales (likely due to its higher profit margin).

The P/E ratio, or ratios to EBIT or EBITDA, are not meaningful if the firm's earnings are negative. In this case, it is common to look at the firm's enterprise value relative to sales. The risk in doing so, however, is that earnings might be negative because the firm's underlying business model is fundamentally flawed, as was the case for many Internet firms in the late 1990s.

Operating Returns

Analysts often evaluate the firm's return on investment by comparing its income to its investment using ratios such as the firm's **return on equity (ROE)**:¹⁴

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Book Value of Equity}} \quad (2.20)$$

Global's ROE in 2022 was $2.0/22.2 = 9.0\%$. The ROE provides a measure of the return that the firm has earned on its past investments. A high ROE may indicate the firm is able to find investment opportunities that are very profitable.

¹⁴ Because net income is measured over the year, the ROE can also be calculated based on the average book value of equity at the end of the current and prior year.

Another common measure is **return on assets (ROA)**, which we calculate as:¹⁵

$$\text{Return on Assets} = \frac{\text{Net Income} + \text{Interest Expense}}{\text{Book Value of Assets}} \quad (2.21)$$

The ROA calculation includes interest expense in the numerator because the assets in the denominator have been funded by both debt and equity investors.

As a performance measure, ROA has the benefit that it is less sensitive to leverage than ROE. However, it is sensitive to working capital—for example, an equal increase in the firm's receivables and payables will increase total assets and thus lower ROA. To avoid this problem, we can consider the firm's **return on invested capital (ROIC)**:

$$\text{Return on Invested Capital} = \frac{\text{EBIT} (1 - \text{tax rate})}{\text{Book Value of Equity} + \text{Net Debt}} \quad (2.22)$$

The return on invested capital measures the after-tax profit generated by the business itself, excluding any interest expenses (or interest income), and compares it to the capital raised from equity and debt holders that has already been deployed (i.e., is not held as cash). Of the three measures of operating returns, ROIC is the most useful in assessing the performance of the underlying business.

EXAMPLE 2.7

Computing Operating Returns

Problem

Assess how Global's ability to use its assets effectively has changed in the last year by computing the change in its return on assets and return on invested capital.

Solution

In 2022, Global's ROA was $(2.0 + 7.7)/177.7 = 5.5\%$, compared to an ROA in 2021 of $(1.9 + 4.6)/148.9 = 4.4\%$.

To compute the return on invested capital, we need to calculate after-tax EBIT, which requires an estimate of Global's tax rate. Because $\text{Net income} = \text{Pretax income} \times (1 - \text{tax rate})$, we can estimate $(1 - \text{tax rate}) = \text{Net income}/\text{Pretax income}$. Thus, $\text{EBIT} \times (1 - \text{tax rate}) = 10.4 \times (2.0/2.7) = 7.7$ in 2022, and $7.1 \times (1.9/2.5) = 5.4$ in 2021.

To compute invested capital, note first that Global's net debt was $3.2 + 12.3 + 76.3 - 19.5 = 72.3$ in 2021 and $3.5 + 13.3 + 99.9 - 21.2 = 95.5$ in 2022. Thus, ROIC in 2022 was $7.7/(22.2 + 95.5) = 6.5\%$, compared with $5.4/(21.2 + 72.3) = 5.8\%$ in 2021.

The improvement in Global's ROA and ROIC from 2021 to 2022 suggests that Global was able to use its assets more effectively and increase its return over this period.

¹⁵ ROA is often calculated as $\text{Net Income}/\text{Assets}$, inappropriately ignoring the returns generated by the assets that are being used to support the firm's debt obligations (see also the box on Mismatched Ratios on page 79). Alternatively, the interest expense that is added back is sometimes done on an after-tax basis in order to eliminate the benefit of the tax savings provided by debt. Finally, as with ROE, the *average* book value of assets at the beginning and end of the year may be used.

The DuPont Identity

We can gain further insight into a firm's ROE using a tool called the **DuPont Identity** (named for the company that popularized its use), which expresses the ROE in terms of the firm's profitability, asset efficiency, and leverage:

$$\text{ROE} = \underbrace{\left(\frac{\text{Net Income}}{\text{Sales}} \right)}_{\text{Net Profit Margin}} \times \underbrace{\left(\frac{\text{Sales}}{\text{Total Assets}} \right)}_{\text{Asset Turnover}} \times \underbrace{\left(\frac{\text{Total Assets}}{\text{Book Value of Equity}} \right)}_{\text{Equity Multiplier}} \quad (2.23)$$

The first term in the DuPont Identity is the firm's net profit margin, which measures its overall profitability. The second term is the firm's **asset turnover**, which measures how efficiently the firm is utilizing its assets to generate sales. Together, these terms determine the firm's return on assets. We compute ROE by multiplying by a measure of leverage called the equity multiplier, which indicates the value of assets held per dollar of shareholder equity. The greater the firm's reliance on debt financing, the higher the equity multiplier will be. Applying this identity to Global, we see that in 2022 its asset turnover is $186.7/177.7 = 1.05$, with an equity multiplier of $177.7/22.2 = 8$. Given its net profit margin of 1.07%, we can compute its ROE as

$$\text{ROE} = 9.0\% = 1.07\% \times 1.05 \times 8$$

EXAMPLE 2.8

Determinants of ROE

Problem

For the year ended January 2022, Walmart (WMT) had sales of \$572.8 billion, net income of \$13.7 billion, assets of \$244.9 billion, and a book value of equity of \$83.3 billion. For the same period, Target (TGT) had sales of \$106 billion, net income of \$6.9 billion, total assets of \$53.8 billion, and a book value of equity of \$12.8 billion. Compare these firms' profitability, asset turnover, equity multipliers, and return on equity during this period. If Target had a similar equity multiplier to Walmart during this period, what would its ROE have been?

Solution

Walmart's net profit margin (from Example 2.6) was $13.7/572.8 = 2.39\%$, which was below Target's net profit margin of $6.9/106 = 6.51\%$. On the other hand, Walmart used its assets more efficiently, with an asset turnover of $572.8/244.9 = 2.34$, compared to only $106/53.8 = 1.97$ for Target. Finally, Target had greater leverage (in terms of book value), with an equity multiplier of $53.8/12.8 = 4.20$, relative to Walmart's equity multiplier of $244.9/83.3 = 2.94$. Next, let's compute the ROE of each firm directly, and using the DuPont Identity:

$$\text{Walmart ROE} = \frac{13.7}{83.3} = 16.4\% = 2.39\% \times 2.34 \times 2.94$$

$$\text{Target ROE} = \frac{6.9}{12.8} = 53.9\% = 6.51\% \times 1.97 \times 4.20$$

Note that despite its lower asset turnover, Target had a higher ROE than Walmart due to its higher net profit margin and leverage. If Target had comparable book leverage to Walmart, and so had the same equity multiplier, its ROE would have been $6.51\% \times 2.34 \times 2.94 = 37.7\%$.

To conclude our discussion of financial ratios, Table 2.4 presents the various measures of profitability, liquidity, working capital, interest coverage, leverage, valuation, and operating returns.

TABLE 2.4**Key Financial Ratios for Large U.S. Firms, June 2022**

(Data shows quartiles [25 %, median, 75 %] for U.S. stocks with market capitalization over \$1 billion)

Profitability Ratios		Leverage Ratios (continued)	
Gross Margin [26%, 41%, 61%]	$\frac{\text{Gross Profit}}{\text{Sales}}$	Debt-to-Capital Ratio [21%, 42%, 61%]	$\frac{\text{Total Debt}}{\text{Total Equity} + \text{Total Debt}}$
Operating Margin [3%, 11%, 20%]	$\frac{\text{Operating Income}}{\text{Sales}}$	Debt-to-Enterprise Value Ratio [−3%, 11%, 28%]	$\frac{\text{Net Debt}}{\text{Enterprise Value}}$
EBIT Margin [3%, 11%, 20%]	$\frac{\text{EBIT}}{\text{Sales}}$	Equity Multiplier (book) [1.7x, 2.4x, 3.5x]	$\frac{\text{Total Assets}}{\text{Book Value of Equity}}$
Net Profit Margin [−1%, 7%, 14%]	$\frac{\text{Net Income}}{\text{Sales}}$	Equity Multiplier (market) [1.0x, 1.2x, 1.4x]	$\frac{\text{Enterprise Value}}{\text{Market Value of Equity}}$
Liquidity Ratios		Valuation Ratios	
Current Ratio [1.2x, 1.8x, 2.9x]	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	Market-to-Book Ratio [1.7x, 2.9x, 5.3x]	$\frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$
Quick Ratio [0.7x, 1.2x, 2.1x]	$\frac{\text{Cash \& Short-term Investments} + \text{Accounts Receivable}}{\text{Current Liabilities}}$	Price-Earnings Ratio [10.5x, 18.8x, 31.6x]	$\frac{\text{Share Price}}{\text{Earnings per Share}}$
Cash Ratio [0.2x, 0.5x, 1.1x]	$\frac{\text{Cash}}{\text{Current Liabilities}}$	Enterprise Value to Sales [1.4x, 2.8x, 5.3x]	$\frac{\text{Enterprise Value}}{\text{Sales}}$
Working Capital Ratios		Enterprise Value to EBIT [10.9x, 17.4x, 26.7x]	$\frac{\text{Enterprise Value}}{\text{EBIT}}$
Accounts Receivable Days [32, 49, 68]	$\frac{\text{Accounts Receivable}}{\text{Average Daily Sales}}$	Enterprise Value to EBITDA [8.2x, 12.5x, 19.0x]	$\frac{\text{Enterprise Value}}{\text{EBITDA}}$
Accounts Payable Days [25, 42, 64]	$\frac{\text{Accounts Payable}}{\text{Average Daily Cost of Sales}}$	Operating Returns	
Inventory Days [27, 61, 102]	$\frac{\text{Inventory}}{\text{Average Daily Cost of Sales}}$	Asset Turnover [0.3x, 0.6x, 1.0x]	$\frac{\text{Sales}}{\text{Total Assets}}$
Interest Coverage Ratios		Return on Equity (ROE) [−1%, 11%, 24%]	$\frac{\text{Net Income}}{\text{Book Value of Equity}}$
EBIT/Interest Coverage [1.5x, 6.2x, 15.9x]	$\frac{\text{EBIT}}{\text{Interest Expense}}$	Return on Assets (ROA) [1%, 6%, 10%]	$\frac{\text{Net Income} + \text{Interest Expense}}{\text{Book Value of Assets}}$
EBITDA/Interest Coverage [3.8x, 9.3x, 20.7x]	$\frac{\text{EBITDA}}{\text{Interest Expense}}$	Return on Invested Capital (ROIC) [7%, 13%, 22%]	$\frac{\text{EBIT} (1 - \text{Tax Rate})}{\text{Book Value of Equity} + \text{Net Debt}}$
Leverage Ratios			
Debt-Equity Ratio (book) [26%, 68%, 141%]	$\frac{\text{Total Debt}}{\text{Book Value of Equity}}$		
Debt-Equity Ratio (market) [8%, 24%, 54%]	$\frac{\text{Total Debt}}{\text{Market Value of Equity}}$		

An interactive version of this table is available in the eTextbook and MyLab Finance.

CONCEPT CHECK

1. Why is EBITDA used to assess a firm's ability to meet its interest obligations?
2. What is the difference between a firm's book debt-equity ratio and its market debt-equity ratio?
3. To compare the valuations of firms with very different leverage, which valuation multiples would be most appropriate?
4. What is the DuPont Identity?

2.7 Financial Reporting in Practice

The various financial statements we have examined are of critical importance to investors and financial managers alike. Even with safeguards such as GAAP and auditors, though, financial reporting abuses unfortunately do take place. We now review two of the most infamous examples.

Enron

Enron was the most well known of the accounting scandals of the early 2000s. Enron started as an operator of natural-gas pipelines but evolved into a global trader dealing in a range of products including gas, oil, electricity, and even broadband Internet capacity. A series of events unfolded that, in December 2001, led Enron to file what was, at the time, the largest bankruptcy filing in U.S. history. By the end of that year, the market value of Enron's shares had fallen by over \$60 billion.

Interestingly, throughout the 1990s and up to late 2001, Enron was touted as one of the most successful and profitable companies in America. *Fortune* rated Enron "The Most Innovative Company in America" for six straight years, from 1995 to 2000. But while many aspects of Enron's business were successful, subsequent investigations suggest that Enron executives had been manipulating Enron's financial statements to mislead investors and artificially inflate the price of Enron's stock and maintain its credit rating. In 2000, for example, 96% of Enron's reported earnings were the result of accounting manipulation.¹⁶

Although the accounting manipulations that Enron used were quite sophisticated, the essence of most of the deceptive transactions was surprisingly simple. Enron sold assets at inflated prices to other firms (or, in many cases, business entities that Enron's CFO Andrew Fastow had created), together with a promise to buy back those assets at an even higher future price. Thus, Enron was effectively borrowing money, receiving cash today in exchange for a promise to pay more cash in the future. But Enron recorded the incoming cash as revenue and then hid the promises to buy them back in a variety of ways.¹⁷ In the end, much of Enron's revenue growth and profits in the late 1990s were the result of this type of manipulation.

WorldCom

Enron's record as the largest bankruptcy of all time lasted only until July 21, 2002, when WorldCom, which at its peak had a market capitalization of \$120 billion, filed for bankruptcy. Again, a series of accounting manipulations beginning in 1998 hid the firm's financial problems from investors.

In WorldCom's case, the fraud was to reclassify \$3.85 billion in operating expenses as long-term capital expenditures. The immediate impact of this change was to boost WorldCom's reported earnings: Operating expenses are deducted from earnings immediately, whereas

¹⁶ John R. Kroger, "Enron, Fraud and Securities Reform: An Enron Prosecutor's Perspective," *University of Colorado Law Review* (December 2009): 57–138.

¹⁷ In some cases, these promises were called "price risk management liabilities" and hidden with other trading activities; in other cases they were off-balance sheet transactions that were not fully disclosed.

capital expenditures are depreciated slowly over time. Of course, this manipulation would not boost WorldCom's cash flows, because long-term investments must be deducted on the cash flow statement at the time they are made.

Some investors were concerned by WorldCom's excessive investment compared to the rest of the industry. As one investment advisor commented, "Red flags [were] things like big deviations between reported earnings and excess cash flow... [and] excessive capital expenditures for a long period of time. That was what got us out of WorldCom in 1999."¹⁸

Sarbanes-Oxley Act

The Enron and WorldCom scandals had an immediate and tangible impact on the accounting world. Both firms had been audited by the same accounting firm, Arthur Andersen, and accusations begin to emerge about their business practices in late 2001. By March 2002, Arthur Andersen was indicted on charges following from the Enron case, and it was convicted in June. With its reputation destroyed, the firm quickly collapsed, leaving its clients to find new auditors. These new auditors had a strong incentive to "clean house" and as a result new instances of errors and/or outright fraud were uncovered. Professors Alexander Dyck, Adair Morse, and Luigi Zingales used this event to estimate that nearly 15% of firms may have engaged in some form of financial misrepresentation, and that such fraud costs investors on average 22% of the firm's enterprise value.¹⁹

In an attempt to improve the reliability of financial reporting and corporate governance, Congress passed the Sarbanes-Oxley Act (SOX) in 2002. While SOX contains many provisions, the overall intent of the legislation was to improve the accuracy of information given to both boards and shareholders. SOX attempted to achieve this goal in three ways: (1) by overhauling incentives and the independence in the auditing process, (2) by stiffening penalties for providing false information, and (3) by forcing companies to validate their internal financial control processes.

Because auditors often have a long-standing relationship with their clients and receive lucrative auditing and consulting fees from them, their desire to continue earning these fees may make auditors less willing to challenge management. SOX addressed this concern by putting strict limits on the amount of non-audit fees (consulting or otherwise) that an accounting firm can earn from a company that it audits. It also required that audit partners rotate every five years to limit the likelihood that auditing relationships become too cozy over long periods of time. Finally, SOX called on the SEC to force companies to have audit committees that are dominated by outside directors, with at least one outside director having a financial background.

SOX also stiffened the criminal penalties for providing false information to shareholders (fines of up to \$5 million and up to 20 years imprisonment), and required both the CEO and CFO to personally attest to the accuracy of the firm's financial statements. Furthermore, CEOs and CFOs must return bonuses or profits from the sale of stock that are later shown to be due to misstated financial reports.

Finally, Section 404 of SOX requires senior management and the boards of public companies to validate and certify the process through which funds are allocated and controlled, and outcomes are monitored. Section 404 has arguably garnered more attention than any other section in SOX because of the large potential compliance costs that it places on firms. These costs can be especially significant (in percentage terms) for small companies, and

¹⁸ Robert Olstein, as reported in the *Wall Street Journal*, August 23, 2002.

¹⁹ See "How Pervasive Is Corporate Fraud?" Rotman School of Management Working Paper No. 2222608, 2013.

FINANCE IN TIMES OF DISRUPTION

Bernard Madoff's Ponzi Scheme

"It's only when the tide goes out that you learn who's been swimming naked."
—Warren Buffett

On December 11, 2008, federal agents arrested Bernie Madoff, one of the largest and most successful hedge fund managers. It turned out that the \$65 billion²⁰ fund he ran was in fact a fraud. His spectacular performance of the last 17 years, generating consistent annual returns between 10% and 15%, was actually a complete fabrication. Madoff had been running the world's largest Ponzi scheme: That is, he used the capital contributed by new investors to pay off old investors. His strategy was so successful that for more than a decade investors ranging from Steven Spielberg to New York University, as well as a number of large banks and investment advisors, lined up to invest with him. Indeed, Madoff quite likely would have been able to hide the fraud until his deathbed had not the global financial crisis spurred many investors to seek to withdraw funds from their Madoff accounts in order to raise cash and cover losses elsewhere in their portfolios. In addition, the financial crisis meant there were few new investors with both the cash and

the willingness to invest. As a result, Madoff did not have enough new capital to pay off the investors who wanted to withdraw their capital, and the scheme finally collapsed.*

How was Madoff able to hide perhaps the largest fraud of all time for so long? Rather than simply manipulate his accounting statements, Madoff *made them up* with the assistance of a virtually unknown accounting firm with only one active accountant. Although many investors may have questioned why such a large fund, with \$65 billion in assets, would choose an unknown and tiny audit firm, not enough of them recognized this choice as a potential red flag. In addition, because Madoff's firm was private, it was not subject to the strict regulatory requirements for public companies (such as the Sarbanes-Oxley Act) and so had weak reporting requirements. As this case makes clear, when making an investment decision, it is important not only to review the firm's financial statements, but also to consider the reliability and reputation of the auditors who prepared them.

*For reasons why fraud may be more likely to occur in booms, and then exposed in downturns, see P. Povel, R. Singh, and A. Winton, "Booms, Busts, and Fraud," *Review of Financial Studies* 20 (2007): 1219–1254.

critics have argued that they are sufficiently onerous to cause some firms to avoid them by remaining privately held.²¹

Dodd-Frank Act

To mitigate the compliance burden on small firms, the Dodd-Frank Wall Street Reform and Consumer Protection Act passed in 2010 exempts firms with less than \$75 million in publicly held shares from the SOX Section 404 requirements. It also requires the SEC to study how it might reduce cost for medium-sized firms with a public float of less than \$250 million, and to assess whether such measures would encourage more firms to list on U.S. exchanges.

Dodd-Frank also broadened the whistleblower provisions of SOX, so that an individual who provides "information related to a possible violation of the federal securities laws (including any rules or regulations thereunder)" that results in penalties or recoveries by the SEC or agencies is eligible to receive from 10 to 30% of that penalty or recovery.

Foreign Regulation: Wirecard

The tightening of regulations in the wake of financial scandals is not unique to the U.S. For example, in June 2020 one of Germany's most successful startups, Wirecard AG, revealed that €1.9 billion in cash was "missing," prompting an immediate 72% drop in its share price. Within weeks the company filed for bankruptcy protection, with its stock market valuation falling from a peak of €24 billion in 2018 to essentially zero. Its CEO was arrested and charged with fraud, breach of trust and accounting manipulation. Former COO Jan Marsalek disappeared, and is currently a fugitive on Europol's most wanted list.

²⁰ \$65 billion is the total amount Madoff had reported to his investors, including (fictitious) returns; investigators are still trying to determine the exact amount that investors had actually contributed to the fund, but it appears to be in excess of \$17 billion (see www.madofftrustee.com).

²¹ See Chapter 29 for a more detailed discussion of these and other corporate governance issues.

What made the Wirecard accounting scandal distinctive was the role German regulators initially played in perpetuating the fraud. For years prior to the Wirecard's downfall, allegations spread of financial irregularities at the company. As early as 2015, the *Financial Times* reported accounting inconsistencies, and in 2016 a group of short sellers published a report critical of the company's financial practices. Then, in 2019, the *Financial Times* reported significant irregularities in the company's Asian operations (an important "profit" center for the company). The initial response of German regulators was to defend the company and, rather than investigate the accusations in the article, they opened a criminal investigation of the reporter responsible for the *Financial Times* article. At the same time, the German Federal Financial Supervisory Authority (BaFin) took the unprecedented step of severely restricting short sales of the company's stock, thereby reducing the incentive of investors to investigate for themselves. (Fahmi Quadir, one of the short sellers affected, comments on this restriction in her interview on page 344 in Chapter 9.)

In the wake of the scandal, Germany fired the head and deputy head of BaFin, with finance minister Olaf Scholz announcing that Germany's system of financial regulation "needs to be reorganized, so that it can fulfil its supervisory role more effectively."²² In addition, the German parliament strengthened its oversight, eventually passing a new *Act on Strengthening the Financial Market Integrity*. Despite its name, the law made only modest changes to existing securities laws. Audit committees are now required to have two financial experts and stricter rules apply to who can participate in meetings between the audit committee and the auditors. In addition, the maximum term a lead audit partner can serve on the audit was reduced from seven to five years. Finally, all oversight functions were centralized under BaFin.

It is unclear whether the regulatory changes adopted in the U.S., and more recently in Germany, will be effective in preventing future scandals like WorldCom and Wirecard. Most likely, the regulatory environment will continue to evolve as future abuses are uncovered.

CONCEPT CHECK

1. Describe the transactions Enron used to increase its reported earnings.
2. What is the Sarbanes-Oxley Act, and how was it modified by the Dodd-Frank Act?

²² *Financial Times*, January 29, 2021.

Key Points and Equations

2.1 Firms' Disclosure of Financial Information

- Financial statements are accounting reports that a firm issues periodically to describe its past performance.
- Investors, financial analysts, managers, and other interested parties such as creditors rely on financial statements to obtain reliable information about a corporation.
- The four required financial statements are the balance sheet, the income statement, the statement of cash flows, and the statement of stockholders' equity.

2.2 The Balance Sheet

- The balance sheet shows the current financial position (assets, liabilities, and stockholders' equity) of the firm at a single point in time.
- The two sides of the balance sheet must balance:

$$\text{Assets} = \text{Liabilities} + \text{Stockholders' Equity} \quad (2.1)$$

- The firm's net working capital, which is the capital available in the short term to run the business, is the difference between the firm's current assets and current liabilities. Excluding cash and debt, key components of net working capital are accounts receivable, inventory, and accounts payable.

- Many assets (such as property, plant, and equipment) are listed on the firm's balance sheet based on their historical cost rather than their current market value, whereas other assets (such as customer relationships) are not listed at all.
- Stockholders' equity is the book value of the firm's equity. It differs from market value of the firm's equity, its market capitalization, because of the way assets and liabilities are recorded for accounting purposes. A successful firm's market-to-book ratio typically exceeds 1.
- The enterprise value of a firm is the total value of its underlying business operations:

$$\text{Enterprise Value} = \text{Market Value of Equity} + \text{Debt} - \text{Cash} \quad (2.4)$$

2.3 The Income Statement

- The income statement reports the firm's revenues and expenses, and it computes the firm's bottom line of net income, or earnings, over a given time interval.
- The firm's operating income is equal to its revenues less its cost of goods sold and operating expenses. After adjusting for other, non-operating income or expenses, we have the firm's earnings before interest and taxes, or EBIT.
- Deducting interest and taxes from EBIT gives the firm's net income, which we can divide by the number of shares outstanding to calculate earnings per share (EPS).

2.4 The Statement of Cash Flows

- The statement of cash flows reports the sources and uses of the firm's cash during a given time period, and can be derived from the firm's income statement and the changes in the firm's balance sheet.
- The statement of cash flows shows the cash used (or provided) from operating, investing, and financing activities.

2.5 Other Financial Statement Information

- The change in stockholders' equity can be computed as retained earnings (net income less dividends) plus net sales of stock (new grants or issuances, net of repurchases).
- The management discussion and analysis section of the financial statements contains management's overview of the firm's performance, as well as disclosure of risks the firm faces, including those from off-balance sheet transactions.
- The notes to a firm's financial statements generally contain important details regarding the numbers used in the main statements.

2.6 Financial Statement Analysis

- Financial ratios allow us to (i) compare the firm's performance over time, and (ii) compare the firm to other similar firms.
- Key financial ratios measure the firm's profitability, liquidity, working capital, interest coverage, leverage, valuation, and operating returns. See Table 2.4 for a summary.
- EBITDA measures the cash a firm generates before capital investments:

$$\text{EBITDA} = \text{EBIT} + \text{Depreciation and Amortization} \quad (2.14)$$

- Net debt measures the firm's debt in excess of its cash reserves:

$$\text{Net Debt} = \text{Total Debt} - \text{Cash \& Short-term Investments} \quad (2.17)$$

- The DuPont Identity expresses a firm's ROE in terms of its profitability, asset efficiency, and leverage:

$$\text{ROE} = \underbrace{\left(\frac{\text{Net Income}}{\text{Sales}} \right)}_{\text{Net Profit Margin}} \times \underbrace{\left(\frac{\text{Sales}}{\text{Total Assets}} \right)}_{\text{Asset Turnover}} \times \underbrace{\left(\frac{\text{Total Assets}}{\text{Book Value of Equity}} \right)}_{\text{Equity Multiplier}} \quad (2.23)$$

2.7 Financial Reporting in Practice

- Recent accounting scandals have drawn attention to the importance of financial statements. New legislation has increased the penalties for fraud and tightened the procedures firms must use to assure that statements are accurate.

Key Terms

- 10-K *p.* 60
- 10-Q *p.* 60
- accounts payable *p.* 64
- accounts payable days *p.* 76
- accounts payable turnover *p.* 76
- accounts receivable *p.* 63
- accounts receivable days *p.* 76
- accounts receivable turnover *p.* 76
- accumulated depreciation *p.* 63
- amortization *p.* 64
- annual report *p.* 60
- asset turnover *p.* 82
- assets *p.* 62
- auditor *p.* 60
- balance sheet *p.* 62
- balance sheet identity *p.* 63
- book value *p.* 63
- book value of equity *p.* 65
- capital expenditures *p.* 70
- cash ratio *p.* 75
- convertible bonds *p.* 68
- current assets *p.* 63
- current liabilities *p.* 64
- current ratio *p.* 75
- debt-equity ratio *p.* 77
- debt-to-capital ratio *p.* 78
- debt-to-enterprise value ratio *p.* 78
- deferred taxes *p.* 64
- depreciation expense *p.* 63
- diluted EPS *p.* 68
- dilution *p.* 68
- DuPont Identity *p.* 82
- earnings *p.* 67
- earnings per share (EPS) *p.* 68
- EBIT *p.* 68
- EBIT margin *p.* 73
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- equity multiplier *p.* 79
- financial statements *p.* 60
- Generally Accepted Accounting Principles (GAAP) *p.* 60
- goodwill *p.* 63
- gross margin *p.* 73
- gross profit *p.* 67
- growth stocks *p.* 66
- impairment charge *p.* 64
- income statement *p.* 66
- intangible assets *p.* 63
- interest coverage ratio *p.* 76
- inventories *p.* 63
- inventory days *p.* 76
- inventory turnover *p.* 76
- lease *p.* 64
- leverage *p.* 77
- liabilities *p.* 62
- long-term assets *p.* 63
- long-term debt *p.* 64
- long-term liabilities *p.* 64
- management discussion and analysis (MD&A) *p.* 72
- marketable securities *p.* 63
- market capitalization *p.* 65
- market-to-book ratio (price-to-book [P/B] ratio) *p.* 65
- net debt *p.* 78
- net income *p.* 67
- net profit margin *p.* 74
- net working capital *p.* 74
- off-balance sheet transactions *p.* 72
- operating income *p.* 68
- operating margin *p.* 73
- price-earnings ratio (P/E) *p.* 79
- quick ratio *p.* 75
- retained earnings *p.* 70
- return on assets (ROA) *p.* 81
- return on equity (ROE) *p.* 80
- return on invested capital (ROIC) *p.* 81
- short-term debt *p.* 64
- statement of cash flows *p.* 69
- statement of financial performance *p.* 66
- statement of financial position *p.* 62
- statement of stockholders' equity *p.* 71
- stock options *p.* 68
- stockholders' equity *p.* 71
- total enterprise value (TEV) *p.* 66
- turnover ratios *p.* 76
- value stocks *p.* 66

Further Reading

For a basic primer on financial statements, see T. R. Ittelson, *Financial Statements: A Step-By-Step Guide to Understanding and Creating Financial Reports* (Career Press, 2009).

For additional information on financial accounting, there are many introductory, MBA-level financial accounting textbooks. See T. Dyckman, R. Magee, and G. Pfeiffer, *Financial Accounting* (Cambridge Business Publishers, 2010); and W. Harrison, C. Horngren, and C. W. Thomas, *Financial Accounting* (Prentice Hall, 2013).

For more on financial statement analysis, see J. Whalen, S. Baginski, and M. Bradshaw, *Financial Reporting, Financial Statement Analysis and Valuation: A Strategic Perspective* (South-Western College Pub, 2010); and L. Revsine, D. Collins, B. Johnson, F. Mittelstaedt, *Financial Reporting & Analysis* (McGraw-Hill/Irwin, 2011).

A great deal of public information is available regarding the alleged accounting abuses at Enron Corporation. A useful starting point is a report produced by a committee established by Enron's own board of directors: Report of the Special Investigative Committee of the Board of Directors of Enron (Powers Report), released February 2, 2002 (available online). Information regarding the resolution of Bernard Madoff's Ponzi scheme can be found on the site published by the Securities Investor Protection Act (SIPA) Trustee, www.madofftrustee.com.

For an estimate of the frequency and cost of accounting fraud, see A. Dyck, A. Morse, and L. Zingales, "How Pervasive Is Corporate Fraud?" Rotman School of Management Working Paper No. 2222608, 2021.

Problems Firms' Disclosure of Financial Information

1. What four financial statements can be found in a firm's 10-K filing? What checks are there on the accuracy of these statements?
2. Who reads financial statements? List at least three different categories of people. For each category, provide an example of the type of information they might be interested in and discuss why.
3. Find the most recent financial statements for Starbucks Corporation (SBUX) using the following sources:
 - a. From the company's Web page www.starbucks.com. (*Hint:* Search for "investor relations.")
 - b. From the SEC Web site www.sec.gov. (*Hint:* Search for company filings in the EDGAR database.)
 - c. From the Morningstar Web site www.morningstar.com.
 - d. From at least one other source. (*Hint:* Enter "SBUX 10K" at www.google.com.)

The Balance Sheet

4. Consider the following potential events that might have taken place at Global Conglomerate on December 30, 2022. For each one, indicate which line items in Global's balance sheet would be affected and by how much. Also indicate the change to Global's book value of equity. (In all cases, ignore any tax consequences for simplicity.)
 - a. Global used \$20 million of its available cash to repay \$20 million of its long-term debt.
 - b. A warehouse fire destroyed \$5 million worth of uninsured inventory.
 - c. Global used \$5 million in cash and \$5 million in new long-term debt to purchase a \$10 million building.
 - d. A large customer owing \$3 million for products it already received declared bankruptcy, leaving no possibility that Global would ever receive payment.

- e. Global's engineers discover a new manufacturing process that will cut the cost of its flagship product by over 50%.
 - f. A key competitor announces a radical new pricing policy that will drastically undercut Global's prices.
5. What was the change in Global Conglomerate's book value of equity from 2021 to 2022 according to Table 2.1? Does this imply that the market price of Global's shares increased in 2022? Explain.
 6. Use EDGAR to find Qualcomm's 10-K filing for 2021. From the balance sheet, answer the following questions:
 - a. How much did Qualcomm have in cash, cash equivalents, and marketable securities (short- and long-term)?
 - b. What were Qualcomm's total accounts receivable?
 - c. What were Qualcomm's total assets?
 - d. What were Qualcomm's total liabilities? How much of this was long-term debt?
 - e. What was the book value of Qualcomm's equity?
 7. Find online the annual 10-K report for Costco Wholesale Corporation (COST) for fiscal year 2021 (filed in October 2021). Answer the following questions from their balance sheet:
 - a. How much cash did Costco have at the end of the fiscal year?
 - b. What were Costco's total assets?
 - c. What were Costco's total liabilities? How much debt did Costco have?
 - d. What was the book value of Costco equity?
 8. In early 2018, Ford Motor (F) had a book value of equity of \$34.9 billion, 4.0 billion shares outstanding, and a market price of \$12.50 per share. Ford also had cash of \$38.9 billion, and total debt of \$154.3 billion. Four years later, in early 2022, Ford had a book value of equity of \$48.5 billion, 4.0 billion shares outstanding with a market price of \$21 per share, cash of \$49.6 billion, and total debt of \$138.1 billion. Over this period, what was the change in Ford's
 - a. market capitalization?
 - b. market-to-book ratio?
 - c. enterprise value?
 9. In early 2018, Adidas (ADS) had a book equity of \$1,397 million, a price per share of \$24.68, and 69.52 million shares outstanding. At the same time, Nike (NKE) had a book equity of \$3,000 million, a share price of \$41.86, and 422.62 million shares outstanding.
 - a. What is the market-to-book ratio of each of these clothing retailers?
 - b. What conclusions can you draw by comparing the two ratios?
 10. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. What is Mydeco's market capitalization at the end of each year?
 - b. What is Mydeco's market-to-book ratio at the end of each year?
 - c. What is Mydeco's enterprise value at the end of each year?

The Income Statement

11. Suppose that in 2023, Global launches an aggressive marketing campaign that boosts sales by 15%. However, their operating margin falls from 5.57% to 4.50%. Suppose that they have no other income, interest expenses are unchanged, and taxes are the same percentage of pretax income as in 2022.
 - a. What is Global's EBIT in 2023?
 - b. What is Global's net income in 2023?
 - c. If Global's P/E ratio and number of shares outstanding remains unchanged, what is Global's share price in 2023?

TABLE 2.5**2019–2023 Financial Statement Data and Stock Price Data for Mydeco Corp.***

Mydeco Corp. 2019–2023		(All data as of fiscal year end; in \$ million)				
Income Statement	2019	2020	2021	2022	2023	
Revenue	404.3	363.8	424.6	510.7	604.1	
Cost of Goods Sold	(188.3)	(173.8)	(206.2)	(246.8)	(293.4)	
Gross Profit	216.0	190.0	218.4	263.9	310.7	
Sales and Marketing	(66.7)	(66.4)	(82.8)	(102.1)	(120.8)	
Administration	(60.6)	(59.1)	(59.4)	(66.4)	(78.5)	
Depreciation & Amortization	(27.3)	(27.0)	(34.3)	(38.4)	(38.6)	
EBIT	61.4	37.5	41.9	57.0	72.8	
Interest Income (Expense)	(33.7)	(32.9)	(32.2)	(37.4)	(39.4)	
Pretax Income	27.7	4.6	9.7	19.6	33.4	
Income Tax	(9.7)	(1.6)	(3.4)	(6.9)	(11.7)	
Net Income	18.0	3.0	6.3	12.7	21.7	
Shares outstanding (millions)	55.0	55.0	55.0	55.0	55.0	
Earnings per share	\$0.33	\$0.05	\$0.11	\$0.23	\$0.39	
Balance Sheet	2019	2020	2021	2022	2023	
Assets						
Cash	48.8	68.9	86.3	77.5	85.0	
Accounts Receivable	88.6	69.8	69.8	76.9	86.1	
Inventory	33.7	30.9	28.4	31.7	35.3	
Total Current Assets	171.1	169.6	184.5	186.1	206.4	
Net Property, Plant & Equip.	245.3	243.3	309.0	345.6	347.0	
Goodwill & Intangibles	361.7	361.7	361.7	361.7	361.7	
Total Assets	778.1	774.6	855.2	893.4	915.1	
Liabilities & Stockholders' Equity						
Accounts Payable	18.7	17.9	22.0	26.8	31.7	
Accrued Compensation	6.7	6.4	7.0	8.1	9.7	
Total Current Liabilities	25.4	24.3	29.0	34.9	41.4	
Long-term Debt	500.0	500.0	575.0	600.0	600.0	
Total Liabilities	525.4	524.3	604.0	634.9	641.4	
Stockholders' Equity	252.7	250.3	251.2	258.5	273.7	
Total Liabilities & Stockholders' Equity	778.1	774.6	855.2	893.4	915.1	
Statement of Cash Flows	2019	2020	2021	2022	2023	
Net Income	18.0	3.0	6.3	12.7	21.7	
Depreciation & Amortization	27.3	27.0	34.3	38.4	38.6	
Chg. in Accounts Receivable	3.9	18.8	(0.0)	(7.1)	(9.2)	
Chg. in Inventory	(2.9)	2.8	2.5	(3.3)	(3.6)	
Chg. in Payables & Accrued Comp.	2.2	(1.1)	4.7	5.9	6.5	
Cash from Operations	48.5	50.5	47.8	46.6	54.0	
Capital Expenditures	(25.0)	(25.0)	(100.0)	(75.0)	(40.0)	
Cash from Investing Activities	(25.0)	(25.0)	(100.0)	(75.0)	(40.0)	
Dividends Paid	(5.4)	(5.4)	(5.4)	(5.4)	(6.5)	
Sale (or purchase) of stock	—	—	—	—	—	
Debt Issuance (Pay Down)	—	—	75.0	25.0	—	
Cash from Financing Activities	(5.4)	(5.4)	69.6	19.6	(6.5)	
Change in Cash	18.1	20.1	17.4	(8.8)	7.5	
Mydeco Stock Price	\$7.92	\$3.30	\$5.25	\$8.71	\$10.89	
*For simplicity, any limitations on the tax deductibility of interest are ignored.						

*For simplicity, any limitations on the tax deductibility of interest are ignored.

12. Find online the annual 10-K report for Costco Wholesale Corporation (COST) for fiscal year 2021 (filed in October 2021). Answer the following questions from their income statement:
 - a. What were Costco's revenues for fiscal year 2021? By what percentage did revenues grow from the prior year?
 - b. What was Costco's operating income for the fiscal year?
 - c. What was Costco's average tax rate for the year?
 - d. What were Costco's diluted earnings per share in fiscal year 2021? What number of shares is this EPS based on?
13. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. By what percentage did Mydeco's revenues grow each year from 2020–2023?
 - b. By what percentage did net income grow each year?
 - c. Why might the growth rates of revenues and net income differ?
14. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp. Suppose Mydeco repurchases 2 million shares each year from 2020 to 2023. What would its earnings per share be in years 2020–2023? (Assume Mydeco pays for the shares using its available cash and that Mydeco earns no interest on its cash balances.)
15. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp. Suppose Mydeco had purchased additional equipment for \$12 million at the end of 2020, and this equipment was depreciated by \$4 million per year in 2021, 2022, and 2023. Given Mydeco's tax rate of 35%, what impact would this additional purchase have had on Mydeco's net income in years 2020–2023? (Assume the equipment is paid for out of cash and that Mydeco earns no interest on its cash balances.)
16. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp. Suppose Mydeco's costs and expenses had been the same fraction of revenues in 2020–2023 as they were in 2019. What would Mydeco's EPS have been each year in this case?
17. Suppose a firm's tax rate is 25%.
 - a. What effect would a \$10 million operating expense have on this year's earnings? What effect would it have on next year's earnings?
 - b. What effect would a \$10 million capital expense have on this year's earnings if the capital is depreciated at a rate of \$2 million per year for five years? What effect would it have on next year's earnings?
18. Seagate Corporation has 6.78 billion shares outstanding and a share price of \$17.61. Seagate is considering developing a new networking product in house at a cost of \$496 million. Alternatively, Seagate can acquire a firm that already has the technology for \$898 million worth (at the current price) of Seagate stock. Suppose that absent the expense of the new technology, Seagate will have EPS of \$0.75.
 - a. Suppose Seagate develops the product in house. What impact would the development cost have on Seagate's EPS? Assume all costs are incurred this year and are treated as an R&D expense, Seagate's tax rate is 35%, and the number of shares outstanding is unchanged.
 - b. Suppose Seagate does not develop the product in house but instead acquires the technology. What effect would the acquisition have on Seagate's EPS this year? (Note that acquisition expenses do not appear directly on the income statement. Assume the firm was acquired at the start of the year and has no revenues or expenses of its own, so that the only effect on EPS is due to the change in the number of shares outstanding.)
 - c. Which method of acquiring the technology has a smaller impact on earnings? Is this method cheaper? Explain.

The Statement of Cash Flows

19. Find online the annual 10-K report for Costco Wholesale Corporation (COST) for fiscal year 2021 (filed in October 2021). Answer the following questions from their cash flow statement:
 - a. How much cash did Costco generate from operating activities in fiscal year 2021?
 - b. What was Costco's total depreciation and amortization expense?

- c. How much cash was invested in new property and equipment (net of any sales)?
- d. How much did Costco raise from the sale of shares of its stock (net of any purchases)?
- 20. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. From 2019 to 2023, what was the total cash flow from operations that Mydeco generated?
 - b. What fraction of the total in (a) was spent on capital expenditures?
 - c. What fraction of the total in (a) was spent paying dividends to shareholders?
 - d. What was Mydeco's total retained earnings for this period?
- 21. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. In what year was Mydeco's net income the lowest?
 - b. In what year did Mydeco need to reduce its cash reserves?
 - c. Why did Mydeco need to reduce its cash reserves in a year when net income was reasonably high?
- 22. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp. Use the data from the balance sheet and cash flow statement in 2019 to determine the following:
 - a. How much cash did Mydeco have at the end of 2018?
 - b. What were Mydeco's accounts receivable and inventory at the end of 2018?
 - c. What were Mydeco's total liabilities at the end of 2018?
 - d. Assuming goodwill and intangibles were equal in 2018 and 2019, what was Mydeco's net property, plant, and equipment at the end of 2018?
- 23. Can a firm with positive net income run out of cash? Explain.
- 24. Suppose your firm receives a \$5.9 million order on the last day of the year. You fill the order with \$1.9 million worth of inventory. The customer picks up the entire order the same day and pays \$2.8 million upfront in cash; you also issue a bill for the customer to pay the remaining balance of \$3.1 million in 30 days. Suppose your firm's tax rate is 0% (i.e., ignore taxes). Determine the consequences of this transaction for each of the following:
 - a. Revenues b. Earnings c. Receivables d. Inventory e. Cash
- 25. Nokela Industries purchases a \$43.52 million cyclo-converter. The cyclo-converter will be depreciated by \$10.88 million per year over four years, starting this year. Suppose Nokela's tax rate is 35%.
 - a. What impact will the cost of the purchase have on earnings for each of the next four years?
 - b. What impact will the cost of the purchase have on the firm's cash flow for the next four years?

Other Financial Statement Information

- 26. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. What were Mydeco's retained earnings each year?
 - b. Using the data from 2019, what was Mydeco's total stockholders' equity in 2018?
- 27. Find online the annual 10-K report for Costco Wholesale Corporation (COST) for fiscal year 2021 (filed in October 2021). Answer the following questions from the notes to their financial statements:
 - a. How many stores (warehouses) did Costco open outside of the U.S. in 2021?
 - b. What fraction of their warehouses do they own versus lease?
 - c. What was Costco's worldwide member renewal rate for 2021?
 - d. What fraction of Costco's 2021 sales (by merchandise category) came from ancillary business (gas stations and pharmacies)? What fraction came from foods, including fresh foods?

Financial Statement Analysis

- 28. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. What were Mydeco's gross margins each year?
 - b. Comparing Mydeco's gross margin, EBIT margin, and net profit margin in 2019 to 2023, which margins improved?
- 29. At the end of 2021, Walmart Inc. (WMT) reported annual revenues of \$572.8 billion, gross profit of \$143.8 billion, and net income of \$13.7 billion. Costco Wholesale Corporation

- (COST) had revenue of \$192.1 billion, gross profit of \$21.4 billion, and net income of \$5.0 billion.
- Compare the gross margins for Walmart and Costco.
 - Compare the net profit margins for Walmart and Costco.
 - Which firm was more profitable in 2021?
- At the end of 2017, Apple had cash and short-term investments of \$41.62 billion, accounts receivable of \$36.19 billion, current assets of \$89.66 billion, and current liabilities of \$80.37 billion.
 - What was Apple's current ratio?
 - What was Apple's quick ratio?
 - What was Apple's cash ratio?
 - At the end of 2017, HPQ had a cash ratio of 0.35, a quick ratio of 0.72 and a current ratio of 1.22. What can you say about the asset liquidity of Apple relative to HPQ?
 - See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - How did Mydeco's accounts receivable days change over this period?
 - How did Mydeco's inventory days change over this period?
 - Based on your analysis, has Mydeco improved its management of its working capital during this time period?
 - See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - Compare Mydeco's accounts payable days in 2019 and 2023.
 - Did this change in accounts payable days improve or worsen Mydeco's cash position in 2023?
 - See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - By how much did Mydeco increase its debt from 2019 to 2023?
 - What was Mydeco's EBITDA/Interest coverage ratio in 2019 and 2023? Did its coverage ratio ever fall below 2?
 - Overall, did Mydeco's ability to meet its interest payments improve or decline over this period?
 - See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - How did Mydeco's book debt-equity ratio change from 2019 to 2023?
 - How did Mydeco's market debt-equity ratio change from 2019 to 2023?
 - Compute Mydeco's debt-to-enterprise value ratio to assess how the fraction of its business that is debt financed has changed over the period.
 - Use the data in Problem 8 to determine the change, from 2018 to 2022, in Ford's
 - book debt-equity ratio.
 - market debt-equity ratio.
 - You are analyzing the leverage of two firms and you note the following (all values in millions of dollars):

	Debt	Book Equity	Market Equity	EBIT	Interest Expense
Firm A	500	300	400	100	50
Firm B	80	35	40	8	7

- What is the market debt-to-equity ratio of each firm?
 - What is the book debt-to-equity ratio of each firm?
 - What is the EBIT/interest coverage ratio of each firm?
 - Which firm may have more difficulty meeting its debt obligations? Explain.
- See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - Compute Mydeco's PE ratio each year from 2019 to 2023. In which year was it the highest?
 - What was Mydeco's Enterprise Value to EBITDA ratio each year? In which year was it the highest?
 - What might explain the differing time pattern of the two valuation ratios?
 - In early 2018, United Airlines (UAL) had a market capitalization of \$25.14 billion, debt of \$12.73 billion, and cash of \$5.59 billion. United also had annual revenues of \$38.72 billion.

Southwest Airlines (LUV) had a market capitalization of \$28.53 billion, debt of \$2.24 billion, cash of \$3.51 billion, and annual revenues of \$18.25 billion.

- a. Compare the market capitalization-to-revenue ratio (also called the price-to-sales ratio) for United Airlines and Southwest Airlines.
 - b. Compare the enterprise value-to-revenue ratio for United Airlines and Southwest Airlines.
 - c. Which of these comparisons is more meaningful? Explain.
39. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp.
 - a. Compute Mydeco's ROE each year from 2019 to 2023.
 - b. Compute Mydeco's ROA each year from 2019 to 2023.
 - c. Which return is more volatile? Why?
 40. See Table 2.5 showing financial statement data and stock price data for Mydeco Corp. Was Mydeco able to improve its ROIC in 2023 relative to what it was in 2019?
 41. For fiscal year 2017, Aeon Group had a net profit margin of 2.05%, asset turnover of 3.48, and a book equity multiplier of 3.15.
 - a. Use this data to compute Aeon's ROE using the DuPont Identity.
 - b. If Aeon's managers wanted to increase its ROE by one percentage point, how much higher would their asset turnover need to be?
 - c. If Aeon's net profit margin fell by one percentage point, by how much would their asset turnover need to increase to maintain their ROE?
 42. For fiscal year 2018, Tesco had total revenues of \$485.65 billion, net income of \$16.36 billion, total assets of \$203.49 billion, and total shareholder's equity of \$81.39 billion.
 - a. Calculate Tesco's ROE directly, and using the DuPont Identity.
 - b. Comparing with the data for Aeon in Problem 41, use the DuPont Identity to understand the difference between the two firms' ROEs.
 43. Consider a retailing firm with a net profit margin of 3.5%, a total asset turnover of 1.8, total assets of \$44 million, and a book value of equity of \$18 million.
 - a. What is the firm's current ROE?
 - b. If the firm increased its net profit margin to 4%, what would be its ROE?
 - c. If, in addition, the firm increased its revenues by 20% (while maintaining this higher profit margin and without changing its assets or liabilities), what would be its ROE?

Financial Reporting in Practice

44. Find online the annual 10-K report for Costco Wholesale Corporation (COST) for fiscal year 2021 (filed in October 2021).
 - a. Which auditing firm certified these financial statements?
 - b. Which officers of Costco certified the financial statements?
45. WorldCom reclassified \$3.85 billion of operating expenses as capital expenditures. Explain the effect this reclassification would have on WorldCom's cash flows. (*Hint*: Consider taxes.) WorldCom's actions were illegal and clearly designed to deceive investors. But if a firm could legitimately choose how to classify an expense for tax purposes, which choice is truly better for the firm's investors?

Data Case

This is your second interview with a prestigious brokerage firm for a job as an equity analyst. You survived the morning interviews with the department manager and the Vice President of Equity. Everything has gone so well that they want to test your ability as an analyst. You are seated in a room with a computer and a list with the names of two companies—Ford (F) and Microsoft (MSFT). You have 90 minutes to complete the following tasks:

1. Download each company's annual income statements, balance sheets, and cash flow statements for the last four fiscal years and export the statements to Excel.

2. Find historical stock prices for each firm for the dates of each financial statement. Use the closing stock prices (not the adjusted close). To calculate the firm's market capitalization at each date, multiply the number of shares outstanding at the time by the firm's historic stock price.
3. For each of the four years of statements, compute the following ratios for each firm:

Valuation Ratios

Price-Earnings Ratio (for EPS use Diluted EPS Total)

Market-to-Book Ratio

Enterprise Value-to-EBITDA

(For debt, include long-term and short-term debt; for cash, include marketable securities.)

Profitability Ratios

Operating Margin

Net Profit Margin

Return on Equity

Financial Strength Ratios

Current Ratio

Book Debt-Equity Ratio

Market Debt-Equity Ratio

Interest Coverage Ratio ($\text{EBIT} \div \text{Interest Expense}$)

4. Using the dynamic version of Table 2.4 (which can display the distribution of financial ratios by industry and is available in [MyLab](#)):
 - a. Compare each firm's ratios to the available industry ratios (automobile manufacturers and systems software) for the most recent year.
 - b. Analyze the performance of each firm versus the industry and comment on any trends in each individual firm's performance. Identify any strengths or weaknesses you find in each firm.
5. Examine the Market-to-Book ratios you calculated for each firm. Which, if any, of the two firms can be considered "growth firms" and which, if any, can be considered "value firms"?
6. Compare the valuation ratios across the two firms. How do you interpret the difference between them?
7. Consider the enterprise value of each firm for each of the four years. How have the values of each firm changed over the time period?

Note: See www.berkdemarzo.com for updates to this Data Case as well as potential sources for the required data.

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Financial Decision Making and the Law of One Price

CHAPTER

3

IN MID-2007, MICROSOFT DECIDED TO ENTER A BIDDING WAR with competitors Google and Yahoo! for a stake in the fast-growing social networking site, Facebook. How did Microsoft's managers decide that this was a good decision?

Every decision has future consequences that will affect the value of the firm. These consequences will generally include both benefits and costs. For example, after raising its offer, Microsoft ultimately succeeded in buying a 1.6% stake in Facebook, along with the right to place banner ads on the Facebook Web site, for \$240 million. In addition to this up-front payment, Microsoft also incurred ongoing expenses associated with software development for the advertising platform, network infrastructure, and international marketing efforts to attract advertisers. The benefits of the deal to Microsoft included the revenues associated with the advertising sales, together with the appreciation of its 1.6% stake in Facebook. In the end, Microsoft's decision appeared to be a good one—in addition to advertising benefits, by the time of Facebook's IPO in May 2012, the value of Microsoft's 1.6% stake had grown to over \$1 billion.

More generally, a decision is good for the firm's investors if it increases the firm's value by providing benefits whose total value exceeds their cost. But comparing costs and benefits is often complicated because they occur at different points in time, may be in different currencies, or may have different risks associated with them. To make a valid comparison, we must use the tools of finance to express all costs and benefits in common terms. In this chapter, we introduce a central principle of finance, which we name the *Valuation Principle*, which states that we can use current market prices to determine the value today of the costs and benefits associated with a decision. This principle allows us to apply the concept of *net present value (NPV)* as a way to compare the costs and benefits of a project in terms of a common unit—namely, dollars today. We will then be able to evaluate a decision by answering this question: *Does the cash value today of its benefits exceed the cash value today of its costs?* In addition, we will see that the NPV indicates the net amount by which the decision will increase wealth.

NOTATION

NPV net present value

r_f risk-free interest rate

PV present value

We then turn to financial markets and apply these same tools to determine the prices of securities that trade in the market. We discuss strategies called *arbitrage*, which allow us to exploit situations in which the prices of publicly available investment opportunities do not conform to these values. Because investors trade rapidly to take advantage of arbitrage opportunities, we argue that equivalent investment opportunities trading simultaneously in competitive markets must have the same price. This *Law of One Price* is the unifying theme of valuation that we use throughout this text.

3.1 Valuing Decisions

A financial manager's job is to make decisions on behalf of the firm's investors. For example, when faced with an increase in demand for the firm's products, a manager may need to decide whether to raise prices or increase production. If the decision is to raise production and a new facility is required, is it better to rent or purchase the facility? If the facility will be purchased, should the firm pay cash or borrow the funds needed to pay for it?

In this book, our objective is to explain how to make decisions that increase the value of the firm to its investors. In principle, the idea is simple and intuitive: For good decisions, the benefits exceed the costs. Of course, real-world opportunities are usually complex and so the costs and benefits are often difficult to quantify. The analysis will often involve skills from other management disciplines, as in these examples:

Marketing: to forecast the increase in revenues resulting from an advertising campaign

Accounting: to estimate the tax savings from a restructuring

Economics: to determine the increase in demand from lowering the price of a product

Organizational Behavior: to estimate the productivity gains from a change in management structure

Strategy: to predict a competitor's response to a price increase

Operations: to estimate the cost savings from a plant modernization

Once the analysis of these other disciplines has been completed to quantify the costs and benefits associated with a decision, the financial manager must compare the costs and benefits and determine the best decision to make for the value of the firm.

Analyzing Costs and Benefits

The first step in decision making is to identify the costs and benefits of a decision. The next step is to quantify these costs and benefits. In order to compare the costs and benefits, we need to evaluate them in the same terms—cash today. Let's make this concrete with a simple example.

Suppose a jewelry manufacturer has the opportunity to trade 400 ounces of silver for 10 ounces of gold today. Because an ounce of gold differs in value from an ounce of silver, it is incorrect to compare 400 ounces to 10 ounces and conclude that the larger quantity is better. Instead, to compare the costs and benefits, we first need to quantify their values in equivalent terms.

Consider the silver. What is its cash value today? Suppose silver can be bought and sold for a current market price of \$25 per ounce. Then the 400 ounces of silver we give up has a cash value of ¹

$$(400 \text{ ounces of silver today}) \times (\$25/\text{ounce of silver today}) = \$10,000 \text{ today}$$

If the current market price for gold is \$1900 per ounce, then the 10 ounces of gold we receive has a cash value of

$$(10 \text{ ounces of gold today}) \times (\$1900/\text{ounce of gold today}) = \$19,000 \text{ today}$$

Now that we have quantified the costs and benefits in terms of a common measure of value, cash today, we can compare them. The jeweler's opportunity has a benefit of \$19,000 today and a cost of \$10,000 today, so the net value of the decision is $\$19,000 - \$10,000 = \$9,000$ today. By accepting the trade, the jewelry firm will be richer by \$9,000.

Using Market Prices to Determine Cash Values

In evaluating the jeweler's decision, we used the current market price to convert from ounces of silver or gold to dollars. We did not concern ourselves with whether the jeweler thought that the price was fair or whether the jeweler would use the silver or gold. Do such considerations matter? Suppose, for example, that the jeweler does not need the gold, or thinks the current price of gold is too high. Would he value the gold at less than \$19,000? The answer is no—he can always sell the gold at the current market price and receive \$19,000 right now. Similarly, he would not value the gold at more than \$19,000, because even if he really needs the gold or thinks the current price of gold is too low, he can always buy 10 ounces of gold for \$19,000. Thus, independent of his own views or preferences, the value of the gold to the jeweler is \$19,000.

This example illustrates an important general principle: Whenever a good trades in a **competitive market**—by which we mean a market in which it can be bought *and* sold at the same price—that price determines the cash value of the good. As long as a competitive market exists, the value of the good will not depend on the views or preferences of the decision maker.

EXAMPLE 3.1

Competitive Market Prices Determine Value

Problem

You have just won a radio contest and are disappointed to find out that the prize is four tickets to the Def Leppard reunion tour (face value \$40 each). Not being a fan of 1980s power rock, you have no intention of going to the show. However, there is a second choice: two tickets to your favorite band's sold-out show (face value \$45 each). You notice that tickets to the Def Leppard show are being bought and sold online for \$30 apiece and tickets to your favorite band's show are being bought and sold at \$50 each. Which prize should you choose?

¹ You might worry about commissions or other transactions costs that are incurred when buying or selling gold, in addition to the market price. For now, we will ignore transactions costs, and discuss their effect in the appendix to this chapter.

Solution

Competitive market prices, not your personal preferences (nor the face value of the tickets), are relevant here:

Four Def Leppard tickets at \$30 apiece = \$120 market value

Two of your favorite band's tickets at \$50 apiece = \$100 market value

Instead of taking the tickets to your favorite band, you should accept the Def Leppard tickets, sell them, and use the proceeds to buy two tickets to your favorite band's show. You'll even have \$20 left over to buy a T-shirt.

Thus, by evaluating cost and benefits using competitive market prices, we can determine whether a decision will make the firm and its investors wealthier. This point is one of the central and most powerful ideas in finance, which we call the **Valuation Principle**:

The value of an asset to the firm or its investors is determined by its competitive market price. The benefits and costs of a decision should be evaluated using these market prices, and when the value of the benefits exceeds the value of the costs, the decision will increase the market value of the firm.

The Valuation Principle provides the basis for decision making throughout this text. In the remainder of this chapter, we first apply it to decisions whose costs and benefits occur at different points in time and develop the main tool of project evaluation, the *Net Present Value Rule*. We then consider its consequences for the prices of assets in the market and develop the concept of the *Law of One Price*.

EXAMPLE 3.2**Applying the Valuation Principle****Problem**

You are the operations manager at your firm. Due to a pre-existing contract, you have the opportunity to acquire 125 barrels of oil and 1500 pounds of copper for a total of \$12,000. The current competitive market price of oil is \$80 per barrel and for copper is \$4 per pound. You are not sure you need all of the oil and copper, and are concerned that the value of both commodities may fall in the future. Should you take this opportunity?

Solution

To answer this question, you need to convert the costs and benefits to their cash values using market prices:

$$\begin{aligned}(125 \text{ barrels of oil}) \times (\$80/\text{barrel of oil today}) &= \$10,000 \text{ today} \\ (1500 \text{ pounds of copper}) \times (\$4/\text{pound of copper today}) &= \$6000 \text{ today}\end{aligned}$$

The net value of the opportunity is $\$10,000 + \$6000 - \$12,000 = \4000 today. Because the net value is positive, you should take it. This value depends only on the *current* market prices for oil and copper. Even if you do not need all the oil or copper, or expect their values to fall, you can sell them at current market prices and obtain their value of \$16,000. Thus, the opportunity is a good one for the firm, and will increase its value by \$4000.

When Competitive Market Prices Are Not Available

Competitive market prices allow us to calculate the value of a decision without worrying about the tastes or opinions of the decision maker. When competitive prices are not available, we can no longer do this. Prices at retail stores, for example, are one sided: You can buy at the posted price, but you cannot sell the good to the store at that same price. We cannot use these one-sided prices to determine an exact cash value. They determine the maximum value of the good (since it can always be purchased at that price), but an individual may value it for much less depending on his or her preferences for the good.

Let's consider an example. It has long been common for banks to entice new depositors by offering free gifts for opening a new account. In 2021, RBC offered a free iPad

for individuals opening a new account. At the time, the retail price of that model iPad was \$329. But because there is no competitive market to trade iPads, the value of the iPad depends on whether you were going to buy one or not.

If you planned to buy the iPad anyway, then the value to you is \$329, the price you would otherwise pay for it. But if you did not want or need the iPad, the value of the offer would depend on the price you could get for the iPad. For example, if you could sell the iPad for \$250 to your friend, then RBC's offer is worth at least \$250 to you. Thus, depending on your preferences, RBC's offer is worth somewhere between \$250 (you don't want an iPad) and \$329 (you definitely want one).

CONCEPT CHECK

1. In order to compare the costs and benefits of a decision, what must we determine?
2. If crude oil trades in a competitive market, would an oil refiner that has a use for the oil value it differently than another investor?

3.2 Interest Rates and the Time Value of Money

For most financial decisions, unlike in the examples presented so far, costs and benefits occur at different points in time. For example, typical investment projects incur costs up front and provide benefits in the future. In this section, we show how to account for this time difference when evaluating a project.

The Time Value of Money

Consider an investment opportunity with the following certain cash flows:

Cost: \$100,000 today

Benefit: \$105,000 in one year

Because both are expressed in dollar terms, it might appear that the cost and benefit are directly comparable so that the project's net value is $\$105,000 - \$100,000 = \$5000$. But this calculation ignores the timing of the costs and benefits, and it treats money today as equivalent to money in one year.

In general, a dollar today is worth more than a dollar in one year. If you have \$1 today, you can invest it. For example, if you deposit it in a bank account paying 7% interest, you will have \$1.07 at the end of one year. We call the difference in value between money today and money in the future the **time value of money**.

The Interest Rate: An Exchange Rate Across Time

By depositing money into a savings account, we can convert money today into money in the future with no risk. Similarly, by borrowing money from the bank, we can exchange money in the future for money today. The rate at which we can exchange money today for money in the future is determined by the current interest rate. In the same way that

an exchange rate allows us to convert money from one currency to another, the interest rate allows us to convert money from one point in time to another. In essence, an interest rate is like an exchange rate across time. It tells us the market price today of money in the future.

Suppose the current annual interest rate is 7%. By investing or borrowing at this rate, we can exchange \$1.07 in one year for each \$1 today. More generally, we define the **risk-free interest rate**, r_f , for a given period as the interest rate at which money can be borrowed or lent without risk over that period. We can exchange $(1 + r_f)$ dollars in the future per dollar today, and vice versa, without risk. We refer to $(1 + r_f)$ as the **interest rate factor** for risk-free cash flows; it defines the exchange rate across time, and has units of “\$ in one year/\$ today.”

As with other market prices, the risk-free interest rate depends on supply and demand. In particular, at the risk-free interest rate the supply of savings equals the demand for borrowing. After we know the risk-free interest rate, we can use it to evaluate other decisions in which costs and benefits are separated in time without knowing the investor’s preferences.

Value of Investment in One Year. Let’s reevaluate the investment we considered earlier, this time taking into account the time value of money. If the interest rate is 7%, then we can express our costs as

$$\begin{aligned}\text{Cost} &= (\$100,000 \text{ today}) \times (1.07 \$ \text{ in one year}/\$ \text{ today}) \\ &= \$107,000 \text{ in one year}\end{aligned}$$

Think of this amount as the opportunity cost of spending \$100,000 today: We give up the \$107,000 we would have had in one year if we had left the money in the bank. Alternatively, if we were to borrow the \$100,000, we would owe \$107,000 in one year.

Both costs and benefits are now in terms of “dollars in one year,” so we can compare them and compute the investment’s net value:

$$\$105,000 - \$107,000 = -\$2000 \text{ in one year}$$

In other words, we could earn \$2000 more in one year by putting our \$100,000 in the bank rather than making this investment. We should reject the investment: If we took it, we would be \$2000 poorer in one year than if we didn’t.

Value of Investment Today. The previous calculation expressed the value of the costs and benefits in terms of dollars in one year. Alternatively, we can use the interest rate factor to convert to dollars today. Consider the benefit of \$105,000 in one year. What is the equivalent amount in terms of dollars today? That is, how much would we need to have in the bank today so that we would end up with \$105,000 in the bank in one year? We find this amount by dividing by the interest rate factor:

$$\begin{aligned}\text{Benefit} &= (\$105,000 \text{ in one year}) \div (1.07 \$ \text{ in one year}/\$ \text{ today}) \\ &= \$105,000 \times \frac{1}{1.07} \text{ today} \\ &= \$98,130.84 \text{ today}\end{aligned}$$

This is also the amount the bank would lend to us today if we promised to repay \$105,000 in one year.² Thus, it is the competitive market price at which we can “buy” or “sell” \$105,000 in one year.

² We are assuming the bank will both borrow and lend at the risk-free interest rate. We discuss the case when these rates differ in “Arbitrage with Transactions Costs” in the appendix to this chapter.

Now we are ready to compute the net value of the investment:

$$\$98,130.84 - \$100,000 = -\$1869.16 \text{ today}$$

Once again, the negative result indicates that we should reject the investment. Taking the investment would make us \$1869.16 poorer today because we have given up \$100,000 for something worth only \$98,130.84.

Present Versus Future Value. This calculation demonstrates that our decision is the same whether we express the value of the investment in terms of dollars in one year or dollars today: We should reject the investment. Indeed, if we convert from dollars today to dollars in one year,

$$(-\$1869.16 \text{ today}) \times (1.07 \text{ \$ in one year/\$ today}) = -\$2000 \text{ in one year}$$

we see that the two results are equivalent, but expressed as values at different points in time. When we express the value in terms of dollars today, we call it the **present value (PV)** of the investment. If we express it in terms of dollars in the future, we call it the **future value (FV)** of the investment.

Discount Factors and Rates. When computing a present value as in the preceding calculation, we can interpret the term

$$\frac{1}{1+r} = \frac{1}{1.07} = 0.93458 \text{ \$ today/\$ in one year}$$

as the *price* today of \$1 in one year. Note that the value is less than \$1—money in the future is worth less today, and so its price reflects a discount. Because it provides the discount at which we can purchase money in the future, the amount $\frac{1}{1+r}$ is called the one-year **discount factor**. The risk-free interest rate is also referred to as the **discount rate** for a risk-free investment.

EXAMPLE 3.3

Comparing Costs at Different Points in Time

Problem

The cost of rebuilding the San Francisco Bay Bridge to make it earthquake-safe was approximately \$3 billion in 2004. At the time, engineers estimated that if the project were delayed to 2005, the cost would rise by 10%. If the interest rate were 2%, what would be the cost of a delay in terms of dollars in 2004?

Solution

If the project were delayed, it would cost \$3 billion $\times 1.10 =$ \$3.3 billion in 2005. To compare this amount to the cost of \$3 billion in 2004, we must convert it using the interest rate of 2%:

$$\$3.3 \text{ billion in 2005} \div (\$1.02 \text{ in 2005/\$ in 2004}) = \$3.235 \text{ billion in 2004}$$

Therefore, the cost of a delay of one year was

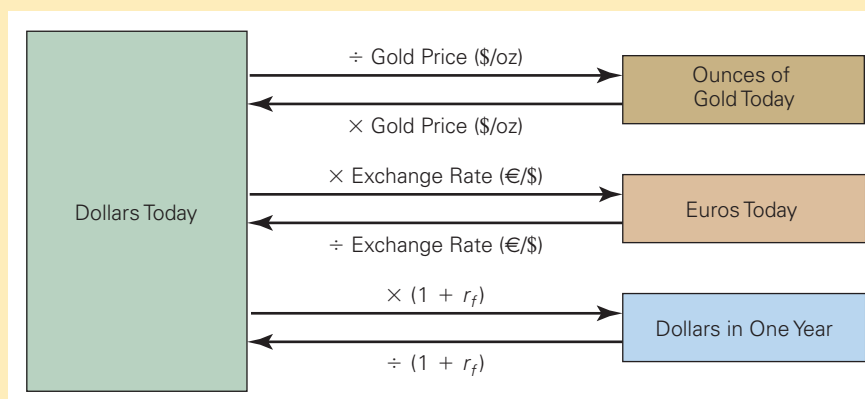
$$\$3.235 \text{ billion} - \$3 \text{ billion} = \$235 \text{ million in 2004}$$

That is, delaying the project for one year was equivalent to giving up \$235 million in cash.

FIGURE 3.1

Converting between Dollars Today and Gold, Euros, or Dollars in the Future

We can convert dollars today to different goods, currencies, or points in time by using the competitive market price, exchange rate, or interest rate.



We can use the risk-free interest rate to determine values in the same way we used competitive market prices. Figure 3.1 illustrates how we use competitive market prices, exchange rates, and interest rates to convert between dollars today and other goods, currencies, or dollars in the future.

CONCEPT CHECK

1. How do you compare costs at different points in time?
2. If interest rates rise, what happens to the value today of a promise of money in one year?

3.3 Present Value and the NPV Decision Rule

In Section 3.2, we converted between cash today and cash in the future using the risk-free interest rate. As long as we convert costs and benefits to the same point in time, we can compare them to make a decision. In practice, however, most corporations prefer to measure values in terms of their present value—that is, in terms of cash today. In this section we apply the Valuation Principle to derive the concept of the *net present value*, or *NPV*, and define the “golden rule” of financial decision making, the *NPV Rule*.

Net Present Value

When we compute the value of a cost or benefit in terms of cash today, we refer to it as the present value (PV). Similarly, we define the **net present value (NPV)** of a project or investment as the difference between the present value of its benefits and the present value of its costs:

Net Present Value

$$NPV = PV(\text{Benefits}) - PV(\text{Costs}) \quad (3.1)$$

If we use positive cash flows to represent benefits and negative cash flows to represent costs, and calculate the present value of multiple cash flows as the sum of present values for individual cash flows, we can also write this definition as

$$NPV = PV(\text{All project cash flows}) \quad (3.2)$$

That is, the NPV is the total of the present values of all project cash flows.

Let's consider a simple example. Suppose your firm is offered the following investment opportunity: In exchange for \$500 today, you will receive \$550 in one year with certainty. If the risk-free interest rate is 8% per year then

$$\begin{aligned} PV(\text{Benefit}) &= (\$550 \text{ in one year}) \div (1.08 \$ \text{ in one year}/\$ \text{ today}) \\ &= \$509.26 \text{ today} \end{aligned}$$

This PV is the amount we would need to put in the bank today to generate \$550 in one year ($\$509.26 \times 1.08 = \550). In other words, *the present value is the cash cost today of "doing it yourself"—it is the amount you need to invest at the current interest rate to recreate the cash flow.*

Once the costs and benefits are in present value terms, we can compute the investment's NPV:

$$NPV = \$509.26 - \$500 = \$9.26 \text{ today}$$

But what if your firm doesn't have the \$500 needed to cover the initial cost of the project? Does the project still have the same value? Because we computed the value using competitive market prices, it should not depend on your tastes or the amount of cash your firm has in the bank. If your firm doesn't have the \$500, it could borrow \$509.26 from the bank at the 8% interest rate and then take the project. What are your cash flows in this case?

$$\begin{aligned} \text{Today:} \quad & \$509.26 \text{ (loan)} - \$500 \text{ (invested in the project)} = \$9.26 \\ \text{In one year:} \quad & \$550 \text{ (from project)} - \$509.26 \times 1.08 \text{ (loan balance)} = \$0 \end{aligned}$$

This transaction leaves you with exactly \$9.26 extra cash today and no future net obligations. So taking the project is like having an extra \$9.26 in cash up front. Thus, the NPV expresses the value of an investment decision as an amount of cash received today. *As long as the NPV is positive, the decision increases the value of the firm and is a good decision regardless of your current cash needs or preferences regarding when to spend the money.*

The NPV Decision Rule

Because NPV is expressed in terms of cash today, it simplifies decision making. As long as we have correctly captured all of the costs and benefits of the project, decisions with a positive NPV will increase the wealth of the firm and its investors. We capture this logic in the **NPV Decision Rule**:

When making an investment decision, take the alternative with the highest NPV. Choosing this alternative is equivalent to receiving its NPV in cash today.

Accepting or Rejecting a Project. A common financial decision is whether to accept or reject a project. Because rejecting the project generally has $NPV = 0$ (there are no new costs or benefits from not doing the project), the NPV decision rule implies that we should

- Accept those projects with positive NPV because accepting them is equivalent to receiving their NPV in cash today, and
- Reject those projects with negative NPV; accepting them would reduce the wealth of investors, whereas not doing them has no cost ($NPV = 0$).

If the NPV is exactly zero, you will neither gain nor lose by accepting the project rather than rejecting it. It is not a bad project because it does not reduce firm value, but it does not increase value either.

EXAMPLE 3.4**The NPV Is Equivalent to Cash Today****Problem**

Your firm needs to buy a new \$9500 high-speed printer. As part of a promotion, the manufacturer has offered to let you pay \$10,000 in one year, rather than pay cash today. Suppose the risk-free interest rate is 7% per year. Is this offer a good deal? Show that its NPV represents cash in your pocket.

Solution

If you take the offer, the benefit is that you won't have to pay \$9500 today, which is already in PV terms. The cost, however, is \$10,000 in one year. We therefore convert the cost to a present value at the risk-free interest rate:

$$PV(\text{Cost}) = (\$10,000 \text{ in one year}) \div (1.07 \$ \text{ in one year}/\$ \text{ today}) = \$9345.79 \text{ today}$$

The NPV of the promotional offer is the difference between the benefits and the costs:

$$NPV = \$9500 - \$9345.79 = \$154.21 \text{ today}$$

The NPV is positive, so the investment is a good deal. It is equivalent to getting a cash discount today of \$154.21, and only paying \$9345.79 today for the printer. To confirm our calculation, suppose you take the offer and invest \$9345.79 in a bank paying 7% interest. With interest, this amount will grow to $\$9345.79 \times 1.07 = \$10,000$ in one year, which you can use to pay for the printer.

Choosing among Alternatives. We can also use the NPV decision rule to choose among projects. To do so, we must compute the NPV of each alternative, and then select the one with the highest NPV. This alternative is the one that will lead to the largest increase in the value of the firm.

EXAMPLE 3.5**Choosing among Alternative Plans****Problem**

Suppose you started a Web site hosting business and then decided to return to school. Now that you are back in school, you are considering selling the business within the next year. An investor has offered to buy the business for \$200,000 whenever you are ready. If the interest rate is 10%, which of the following three alternatives is the best choice?

1. Sell the business now.
2. Scale back the business and continue running it while you are in school for one more year, and then sell the business (requiring you to spend \$30,000 on expenses now, but generating \$50,000 in profit at the end of the year).
3. Hire someone to manage the business while you are in school for one more year, and then sell the business (requiring you to spend \$50,000 on expenses now, but generating \$100,000 in profit at the end of the year).

Solution

The cash flows and NPVs for each alternative are calculated in Table 3.1. Faced with these three alternatives, the best choice is the one with highest NPV: Hire a manager and sell in one year. Choosing this alternative is equivalent to receiving \$222,727 today.

TABLE 3.1**Cash Flows and NPVs for Web Site Business Alternatives**

	Today	In One Year	NPV
Sell Now	\$200,000	0	\$200,000
Scale Back Operations	-\$30,000	\$50,000	$-\$30,000 + \frac{\$250,000}{1.10} = \$197,273$
		\$200,000	
Hire a Manager	-\$50,000	\$100,000	$-\$50,000 + \frac{\$300,000}{1.10} = \$222,727$
		\$200,000	

NPV and Cash Needs

When we compare projects with different patterns of present and future cash flows, we may have preferences regarding when to receive the cash. Some may need cash today; others may prefer to save for the future. In the Web site hosting business example, hiring a manager and selling in one year has the highest NPV. However, this option requires an initial outlay of \$50,000, as opposed to selling the business and receiving \$200,000 immediately. Suppose you also need \$60,000 in cash now to pay for school and other expenses. Would selling the business be a better choice in that case?

As was true for the jeweler considering trading silver for gold in Section 3.1, the answer is again no. As long as you can borrow and lend at the 10% interest rate, hiring a manager is the best choice whatever your preferences regarding the timing of the cash flows. To see why, suppose you borrow \$110,000 at the rate of 10% and hire the manager. Then you will owe $\$110,000 \times 1.10 = \$121,000$ in one year, for total cash flows shown in Table 3.2. Compare these cash flows with those from selling now, and investing the excess \$140,000 (which, at the rate of 10%, will grow to $\$140,000 \times 1.10 = \$154,000$ in one year). Both strategies provide \$60,000 in cash today, but the combination of hiring a manager and borrowing generates an additional $\$179,000 - \$154,000 = \$25,000$ in one year.³ Thus, even if you need \$60,000 now, hiring the manager and selling in one year is still the best option.

TABLE 3.2**Cash Flows of Hiring and Borrowing Versus Selling and Investing**

	Today	In One Year
Hire a Manager	-\$50,000	\$300,000
Borrow	\$110,000	-\$121,000
Total Cash Flow	\$60,000	\$179,000
<i>versus</i>		
Sell Now	\$200,000	\$0
Invest	-\$140,000	\$154,000
Total Cash Flow	\$60,000	\$154,000

³ Note also that the present value of this additional cash flow, $\$25,000 \div 1.10 = \$22,727$, is exactly the difference in NPVs between the two alternatives.

This example illustrates the following general principle:

Regardless of our preferences for cash today versus cash in the future, we should always maximize NPV first. We can then borrow or lend to shift cash flows through time and find our most preferred pattern of cash flows.

CONCEPT CHECK

1. What is the NPV decision rule?
2. Why doesn't the NPV decision rule depend on the investor's preferences?

3.4 Arbitrage and the Law of One Price

So far, we have emphasized the importance of using competitive market prices to compute the NPV. But is there always only one such price? What if the same good trades for different prices in different markets? Consider gold. Gold trades in many different markets, with the largest markets in New York and London. To value an ounce of gold we could look up the competitive price in either of these markets. But suppose gold is trading for \$1850 per ounce in New York and \$1900 per ounce in London. Which price should we use?

Fortunately, such situations do not arise, and it is easy to see why. Recall that these are competitive market prices at which you can both buy *and* sell. Thus, you can make money in this situation simply by buying gold for \$1850 per ounce in New York and then immediately selling it for \$1900 per ounce in London.⁴ You will make $\$1900 - \$1850 = \$50$ per ounce for each ounce you buy and sell. Trading 1 million ounces at these prices, you would make \$50 million with no risk or investment! This is a case where that old adage, “Buy low, sell high,” can be followed perfectly.

Of course, you will not be the only one making these trades. Everyone who sees these prices will want to trade as many ounces as possible. Within seconds, the market in New York would be flooded with buy orders, and the market in London would be flooded with sell orders. Although a few ounces (traded by the lucky individuals who spotted this opportunity first) might be exchanged at these prices, the price of gold in New York would quickly rise in response to all the orders, and the price in London would rapidly fall.⁵ Prices would continue to change until they were equalized somewhere in the middle, such as \$1875 per ounce.

Arbitrage

The practice of buying and selling equivalent goods in different markets to take advantage of a price difference is known as **arbitrage**. More generally, we refer to any situation in which it is possible to make a profit without taking any risk or making any investment as an **arbitrage opportunity**. Because an arbitrage opportunity has a positive NPV, whenever an arbitrage opportunity appears in financial markets, investors will race to take advantage

⁴ There is no need to transport the gold from New York to London because investors in these markets trade ownership rights to gold that is stored securely elsewhere. For now, we ignore any further transactions costs, but discuss their effect in the appendix to this chapter.

⁵ As economists would say, supply would not equal demand in these markets. In New York, demand would be infinite because everyone would want to buy. For equilibrium to be restored so that supply equals demand, the price in New York would have to rise. Similarly, in London there would be infinite supply until the price there fell.

of it. Those investors who spot the opportunity first and who can trade quickly will have the ability to exploit it. Once they place their trades, prices will respond, causing the arbitrage opportunity to evaporate.

Arbitrage opportunities are like money lying in the street; once spotted, they will quickly disappear. Thus the normal state of affairs in markets should be that no arbitrage opportunities exist. We call a competitive market in which there are no arbitrage opportunities a **normal market**.⁶

Law of One Price

In a normal market, the price of gold at any point in time will be the same in London and New York. The same logic applies more generally whenever equivalent investment opportunities trade in two different competitive markets. If the prices in the two markets differ, investors will profit immediately by buying in the market where it is cheap and selling in the market where it is expensive. In doing so, they will equalize the prices. As a result, prices will not differ (at least not for long). This important property is the **Law of One Price**:

If equivalent investment opportunities trade simultaneously in different competitive markets, then they must trade for the same price in all markets.

One useful consequence of the Law of One Price is that when evaluating costs and benefits to compute a net present value, we can use any competitive price to determine a cash value, without checking the price in all possible markets.

CONCEPT CHECK

1. If the Law of One Price were violated, how could investors profit?
2. When investors exploit an arbitrage opportunity, how do their actions affect prices?

3.5 No-Arbitrage and Security Prices

An investment opportunity that trades in a financial market is known as a **financial security** (or, more simply, a **security**). The notions of arbitrage and the Law of One Price have important implications for security prices. We begin exploring its implications for the prices of individual securities as well as market interest rates. We then broaden our perspective to value a package of securities. Along the way, we will develop some important insights about firm decision making and firm value that will underpin our study throughout this textbook.

Valuing a Security with the Law of One Price

The Law of One Price tells us that the prices of equivalent investment opportunities should be the same. We can use this idea to value a security if we can find another equivalent investment whose price is already known. Consider a simple security that promises a one-time payment to its owner of \$1000 in one year's time. Suppose there is no risk that the

⁶ The term *efficient market* is also sometimes used to describe a market that, along with other properties, is without arbitrage opportunities. We avoid that term here because it is stronger than we require, as it also restricts the information held by market participants. We discuss notions of market efficiency in Chapter 9.

payment will not be made. One example of this type of security is a **bond**, a security sold by governments and corporations to raise money from investors today in exchange for the promised future payment. If the risk-free interest rate is 5%, what can we conclude about the price of this bond in a normal market?

To answer this question, consider an alternative investment that would generate the same cash flow as this bond. Suppose we invest money at the bank at the risk-free interest rate. How much do we need to invest today to receive \$1000 in one year? As we saw in Section 3.3, the cost today of recreating a future cash flow on our own is its present value:

$$\begin{aligned} PV(\$1000 \text{ in one year}) &= (\$1000 \text{ in one year}) \div (1.05 \$ \text{ in one year}/\$ \text{ today}) \\ &= \$952.38 \text{ today} \end{aligned}$$

If we invest \$952.38 today at the 5% risk-free interest rate, we will have \$1000 in one year’s time with no risk.

We now have two ways to receive the same cash flow: (1) buy the bond or (2) invest \$952.38 at the 5% risk-free interest rate. Because these transactions produce equivalent cash flows, the Law of One Price implies that, in a normal market, they must have the same price (or cost). Therefore,

$$\text{Price}(\text{Bond}) = \$952.38$$

Identifying Arbitrage Opportunities with Securities. Recall that the Law of One Price is based on the possibility of arbitrage: If the bond had a different price, there would be an arbitrage opportunity. For example, suppose the bond traded for a price of \$940. How could we profit in this situation?

In this case, we can buy the bond for \$940 and at the same time borrow \$952.38 from the bank. Given the 5% interest rate, we will owe the bank $\$952.38 \times 1.05 = \1000 in one year. Our overall cash flows from this pair of transactions are as shown in Table 3.3. Using this strategy we can earn \$12.38 in cash today for each bond that we buy, without taking any risk or paying any of our own money in the future. Of course, as we—and others who see the opportunity—start buying the bond, its price will quickly rise until it reaches \$952.38 and the arbitrage opportunity disappears.

A similar arbitrage opportunity arises if the bond price is higher than \$952.38. For example, suppose the bond is trading for \$960. In that case, we should sell the bond and invest \$952.38 at the bank. As shown in Table 3.4, we then earn \$7.62 in cash today, yet keep our future cash flows unchanged by replacing the \$1000 we would have received from the bond with the \$1000 we will receive from the bank. Once again, as people begin selling the bond to exploit this opportunity, the price will fall until it reaches \$952.38 and the arbitrage opportunity disappears.

TABLE 3.3

Net Cash Flows from Buying the Bond and Borrowing

	Today (\$)	In One Year (\$)
Buy the bond	−940.00	+1000.00
Borrow from the bank	+952.38	−1000.00
Net cash flow	+12.38	0.00

TABLE 3.4**Net Cash Flows from Selling the Bond and Investing**

	Today (\$)	In One Year (\$)
Sell the bond	+960.00	−1000.00
Invest at the bank	−952.38	+1000.00
Net cash flow	+7.62	0.00

When the bond is overpriced, the arbitrage strategy involves selling the bond and investing some of the proceeds. But if the strategy involves selling the bond, does this mean that only the current owners of the bond can exploit it? The answer is no; in financial markets it is possible to sell a security you do not own by doing a *short sale*. In a **short sale**, the person who intends to sell the security first borrows it from someone who already owns it. Later, that person must either return the security by buying it back or pay the owner the cash flows he or she would have received. For example, we could short sell the bond in the example effectively promising to repay the current owner \$1000 in one year. By executing a short sale, it is possible to exploit the arbitrage opportunity when the bond is overpriced even if you do not own it.

Determining the No-Arbitrage Price. We have shown that at any price other than \$952.38, an arbitrage opportunity exists for our bond. Thus, in a normal market, the price of this bond must be \$952.38. We call this price the **no-arbitrage price** for the bond.

By applying the reasoning for pricing the simple bond, we can outline a general process for pricing other securities:

1. Identify the cash flows that will be paid by the security.
2. Determine the “do-it-yourself” cost of replicating those cash flows on our own; that is, the present value of the security’s cash flows.

Unless the price of the security equals this present value, there is an arbitrage opportunity. Thus, the general formula is

No-Arbitrage Price of a Security

$$\text{Price}(\text{Security}) = PV(\text{All cash flows paid by the security}) \quad (3.3)$$

Determining the Interest Rate from Bond Prices. Given the risk-free interest rate, the no-arbitrage price of a risk-free bond is determined by Eq. 3.3. The reverse is also true: If we know the price of a risk-free bond, we can use Eq. 3.3 to determine what the risk-free interest rate must be if there are no arbitrage opportunities.

For example, suppose a risk-free bond that pays \$1000 in one year is currently trading with a competitive market price of \$929.80 today. From Eq. 3.3, we know that the bond’s price equals the present value of the \$1000 cash flow it will pay:

$$\$929.80 \text{ today} = (\$1000 \text{ in one year}) \div (1 + r_f)$$

We can rearrange this equation to determine the risk-free interest rate:

$$1 + r_f = \frac{\$1000 \text{ in one year}}{\$929.80 \text{ today}} = 1.0755 \text{ \$ in one year/\$ today}$$

That is, if there are no arbitrage opportunities, the risk-free interest rate must be 7.55%.

Interest rates are calculated by this method in practice. Financial news services report current interest rates by deriving these rates based on the current prices of risk-free government bonds trading in the market.

Note that the risk-free interest rate equals the percentage gain that you earn from investing in the bond, which is called the bond's **return**:

$$\begin{aligned} \text{Return} &= \frac{\text{Gain at End of Year}}{\text{Initial Cost}} \\ &= \frac{1000 - 929.80}{929.80} = \frac{1000}{929.80} - 1 = 7.55\% \end{aligned} \quad (3.4)$$

Thus, if there is no arbitrage, the risk-free interest rate is equal to the return from investing in a risk-free bond. If the bond offered a higher return than the risk-free interest rate, then investors would earn a profit by borrowing at the risk-free interest rate and investing in the bond. If the bond had a lower return than the risk-free interest rate, investors would sell the bond and invest the proceeds at the risk-free interest rate. No arbitrage is therefore equivalent to the idea that *all risk-free investments should offer investors the same return*.

EXAMPLE 3.6

Computing the No-Arbitrage Price or Interest Rate

Problem

Consider a security that pays its owner \$100 today and \$100 in one year, without any risk. Suppose the risk-free interest rate is 10%. What is the no-arbitrage price of the security today (before the first \$100 is paid)? If the security is trading for \$195, what arbitrage opportunity is available? At what interest rate would the arbitrage opportunity disappear?

Solution

We need to compute the present value of the security's cash flows. In this case there are two cash flows: \$100 today, which is already in present value terms, and \$100 in one year. The present value of the second cash flow is

$$\$100 \text{ in one year} \div 1.10 \text{ \$ in one year/\$ today} = \$90.91 \text{ today}$$

Therefore, the total present value of the cash flows is $\$100 + \$90.91 = \$190.91$ today, which is the no-arbitrage price of the security.

If the security is trading for \$195, we can exploit its overpricing by selling it for \$195. We can then use \$100 of the sale proceeds to replace the \$100 we would have received from the security today and invest \$90.91 of the sale proceeds at 10% to replace the \$100 we would have received in one year. The remaining $\$195 - \$100 - \$90.91 = \4.09 is an arbitrage profit.

At a price of \$195, we are effectively paying \$95 to receive \$100 in one year. So, an arbitrage opportunity exists unless the interest rate equals $100/95 - 1 = 5.26\%$.

An Old Joke

There is an old joke that many finance professors enjoy telling their students. It goes like this:

A finance professor and a student are walking down a street. The student notices a \$100 bill lying on the pavement and leans down to pick it up. The finance professor immediately intervenes and says, "Don't bother; there is no free lunch. If there was a real \$100 bill lying there, somebody would already have picked it up!"

This joke invariably generates much laughter because it makes fun of the principle of no arbitrage in competitive markets. But once the laughter dies down, the professor

then asks whether anyone has ever *actually* found a real \$100 bill lying on the pavement. The ensuing silence is the real lesson behind the joke.

This joke sums up the point of focusing on markets in which no arbitrage opportunities exist. Free \$100 bills lying on the pavement, like arbitrage opportunities, are extremely rare for two reasons: (1) Because \$100 is a large amount of money, people are especially careful not to lose it, and (2) in the rare event when someone does inadvertently drop \$100, the likelihood of your finding it before someone else does is extremely small.

The NPV of Trading Securities and Firm Decision Making

We have established that positive-NPV decisions increase the wealth of the firm and its investors. Think of buying a security as an investment decision. The cost of the decision is the price we pay for the security, and the benefit is the cash flows that we will receive from owning the security. When securities trade at no-arbitrage prices, what can we conclude about the value of trading them? From Eq. 3.3, the cost and benefit are equal in a normal market and so the NPV of buying a security is zero:

$$\begin{aligned} NPV(\text{Buy security}) &= PV(\text{All cash flows paid by the security}) - \text{Price}(\text{Security}) \\ &= 0 \end{aligned}$$

Similarly, if we sell a security, the price we receive is the benefit and the cost is the cash flows we give up. Again the NPV is zero:

$$\begin{aligned} NPV(\text{Sell security}) &= \text{Price}(\text{Security}) - PV(\text{All cash flows paid by the security}) \\ &= 0 \end{aligned}$$

Thus, the NPV of trading a security in a normal market is zero. This result is not surprising. If the NPV of buying a security were positive, then buying the security would be equivalent to receiving cash today—that is, it would present an arbitrage opportunity. Because arbitrage opportunities do not exist in normal markets, the NPV of all security trades must be zero.

Another way to understand this result is to remember that every trade has both a buyer and a seller. In a competitive market, if a trade offers a positive NPV to one party, it must give a negative NPV to the other party. But then one of the two parties would not agree to the trade. Because all trades are voluntary, they must occur at prices at which neither party is losing value, and therefore for which the trade is zero NPV.

The insight that security trading in a normal market is a zero-NPV transaction is a critical building block in our study of corporate finance. Trading securities in a normal market neither creates nor destroys value: Instead, value is created by the real investment projects in which the firm engages, such as developing new products, opening new stores, or creating more efficient production methods. Financial transactions are not sources of value but instead serve to adjust the timing and risk of the cash flows to best suit the needs of the firm or its investors.

An important consequence of this result is the idea that we can evaluate a decision by focusing on its real components, rather than its financial ones. That is, we can separate the firm's investment decision from its financing choice. We refer to this concept as the **Separation Principle**:

Security transactions in a normal market neither create nor destroy value on their own. Therefore, we can evaluate the NPV of an investment decision separately from the decision the firm makes regarding how to finance the investment or any other security transactions the firm is considering.

EXAMPLE 3.7

Separating Investment and Financing

Problem

Your firm is considering a project that will require an up-front investment of \$10 million today and will produce \$12 million in cash flow for the firm in one year without risk. Rather than pay for the \$10 million investment entirely using its own cash, the firm is considering raising additional funds by issuing a security that will pay investors \$5.5 million in one year. Suppose the risk-free interest rate is 10%. Is pursuing this project a good decision without issuing the new security? Is it a good decision with the new security?

Solution

Without the new security, the cost of the project is \$10 million today and the benefit is \$12 million in one year. Converting the benefit to a present value

$$\$12 \text{ million in one year} \div (1.10 \text{ \$ in one year/\$ today}) = \$10.91 \text{ million today}$$

we see that the project has an NPV of \$10.91 million – \$10 million = \$0.91 million today.

Now suppose the firm issues the new security. In a normal market, the price of this security will be the present value of its future cash flow:

$$\text{Price}(\text{Security}) = \$5.5 \text{ million} \div 1.10 = \$5 \text{ million today}$$

Thus, after it raises \$5 million by issuing the new security, the firm will only need to invest an additional \$5 million to take the project.

To compute the project's NPV in this case, note that in one year the firm will receive the \$12 million payout of the project, but owe \$5.5 million to the investors in the new security, leaving \$6.5 million for the firm. This amount has a present value of

$$\$6.5 \text{ million in one year} \div (1.10 \text{ \$ in one year/\$ today}) = \$5.91 \text{ million today}$$

Thus, the project has an NPV of \$5.91 million – \$5 million = \$0.91 million today, as before.

In either case, we get the same result for the NPV. The separation principle indicates that we will get the same result for any choice of financing for the firm that occurs in a normal market. We can therefore evaluate the project without explicitly considering the different financing possibilities the firm might choose.

Valuing a Portfolio

So far, we have discussed the no-arbitrage price for individual securities. The Law of One Price also has implications for packages of securities. Consider two securities, A and B. Suppose a third security, C, has the same cash flows as A and B combined. In this case, security C is equivalent to a combination of the securities A and B. We use the term **portfolio** to describe a collection of securities. What can we conclude about the price of security C as compared to the prices of A and B?

Value Additivity. Because security C is equivalent to the portfolio of A and B, by the Law of One Price, they must have the same price. This idea leads to the relationship known as **value additivity**; that is, the price of C must equal the price of the portfolio, which is the combined price of A and B:

Value Additivity

$$\text{Price}(C) = \text{Price}(A + B) = \text{Price}(A) + \text{Price}(B) \quad (3.5)$$

Because security C has cash flows equal to the sum of A and B, its value or price must be the sum of the values of A and B. Otherwise, an obvious arbitrage opportunity would exist. For example, if the total price of A and B were lower than the price of C, then we could make a profit buying A and B and selling C. This arbitrage activity would quickly push prices until the price of security C equals the total price of A and B.

EXAMPLE 3.8

Valuing an Asset in a Portfolio

Problem

Holbrook Holdings is a publicly traded company with only two assets: It owns 60% of Harry's Hotcakes restaurant chain and an ice hockey team. Suppose the market value of Holbrook Holdings is \$160 million, and the market value of the entire Harry's Hotcakes chain (which is also publicly traded) is \$120 million. What is the market value of the hockey team?

Solution

We can think of Holbrook as a portfolio consisting of a 60% stake in Harry's Hotcakes and the hockey team. By value additivity, the sum of the value of the stake in Harry's Hotcakes and the hockey team must equal the \$160 million market value of Holbrook. Because the 60% stake in Harry's Hotcakes is worth $60\% \times \$120 \text{ million} = \72 million , the hockey team has a value of $\$160 \text{ million} - \$72 \text{ million} = \$88 \text{ million}$.

FINANCE IN TIMES OF DISRUPTION

In 2007, a decade-long boom in U.S. house prices abruptly ended and prices steeply declined. As the severity of the downturn became apparent, investors grew increasingly concerned about the risk that homeowners might default on their mortgages. As a result, the volume of trade in the multi-trillion dollar market for mortgage-backed securities plummeted over 80% by August 2008. Over the next two months, trading in many of these securities ceased altogether, making the markets for these securities increasingly illiquid.

Competitive markets depend upon liquidity—there must be sufficient buyers and sellers of a security so that it is possible to trade at any time at the current market price. When markets become illiquid it may not be possible to trade at the posted price. As a consequence, we can no longer rely on market prices as a measure of value.

The collapse of the mortgage-backed securities market created two problems. First was the loss of trading opportunities, making it difficult for holders of these securities to sell them. But a potentially more significant problem was the loss of *information*. Without a liquid, competitive market for these securities,

Liquidity and the Informational Role of Prices

it became impossible to reliably value these securities. In addition, given that the value of the banks holding these securities was based on the sum of all projects and investments within them, investors could not value the banks either. Investors reacted to this uncertainty by selling both the mortgage-backed securities and securities of banks that held mortgage-backed securities. These actions further compounded the problem by driving down prices to seemingly unrealistically low levels and thereby threatening the solvency of the entire financial system.

The loss of information precipitated by the loss of liquidity played a key role in the breakdown of credit markets. As both investors and government regulators found it increasingly difficult to assess the solvency of the banks, banks found it difficult to raise new funds on their own and also shied away from lending to other banks because of their concerns about the financial viability of their competitors. The result was a breakdown in lending. Ultimately, the government was forced to step in and spend hundreds of billions of dollars in order to (1) provide new capital to support the banks and (2) provide liquidity by creating a market for the now “toxic” mortgage-backed securities.

Arbitrage in Markets

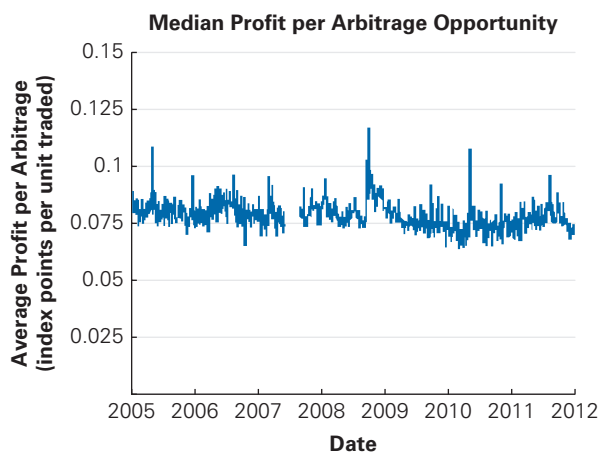
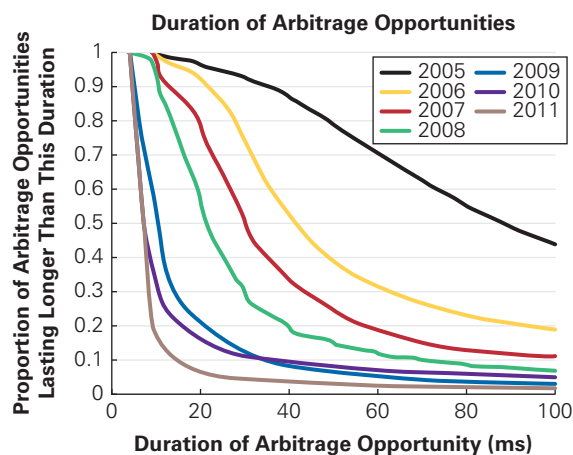
Value additivity is the principle behind a type of trading activity known as stock index arbitrage. Common stock indices (such as the Dow Jones Industrial Average and the Standard and Poor's 500 (S&P 500)) represent portfolios of individual stocks. It is possible to trade the individual stocks that comprise an index on the New York Stock Exchange and Nasdaq. It is also possible to trade the entire index (as a single security) on the futures exchanges in Chicago, or as an exchange-traded fund (ETF) on the NYSE. When the price of the index security is below the total price of the individual stocks, traders buy the index and sell the stocks to capture the price difference. Similarly, when the price of the index security is above the total price of the individual stocks, traders sell the index and buy the individual stocks. In 2012 it was not uncommon for almost half of the daily volume of trade on the NYSE to be due to index arbitrage activity via program trading.*

The traders that engage in stock index arbitrage automate the process by tracking prices and submitting (or cancelling) orders electronically. Over the years the competition to take advantage of these opportunities has caused traders to go to extraordinary lengths to reduce order execution time. One limiting factor is the time it takes to send an order from one exchange to another. For example, in 2010 Spread Networks paid \$300 million for a new fiber optic line that reduced the communication time between New York and Chicago exchanges from 16 milliseconds to 13 milliseconds. Three milliseconds might not sound like a lot (it takes 400 milliseconds to blink), but it meant that Spread would be able to exploit any mispricings between the exchanges before its competitors, at least until one of them constructed a faster line. (Indeed, the Spread advantage did not last long. Within a year, traders began to use microwaves to transmit information in a straight line through the earth, ultimately cutting the communication time to 8 milliseconds.)

The evolution of how traders took advantage of these short-lived arbitrage opportunities provides a nice illustration of how competitive market forces act to remove profit-making opportunities. In a recent study, Professors Eric Budish, Peter Crampton, and John Shim† focused on the evolution of one particular arbitrage opportunity that resulted from differences in the price of the S&P 500 Futures Contract on the Chicago Mercantile Exchange and the price of the SPDR S&P 500 ETF traded on the New York Stock Exchange.

The left figure shows how the duration of arbitrage opportunities changed between 2005 and 2011. Each line shows, for the indicated year, the fraction of arbitrage opportunities that lasted longer than the amount of time indicated on the horizontal axis. So, for example, in 2005 about half of the arbitrage opportunities that existed lasted more than 100 milliseconds. By 2008, this number had dropped to 20 milliseconds, and by 2011, the number was under 10 milliseconds. Note also that in 2005 almost all opportunities lasted at least 20 milliseconds, but by 2011 the number of opportunities that lasted this long was less than 10% and hardly any persisted for more than 100 milliseconds.

What happened to the profits from exploiting these mispricings? You might have expected that the effect of this competition would be to decrease profits, but as the right figure shows, profits per opportunity remained relatively constant. Furthermore, the number of opportunities did not systematically decline over this period, implying that the aggregate profits from exploiting arbitrage opportunities did not diminish. In that sense, the competition between arbitrageurs has not reduced the magnitude or frequency of price deviations across these markets, but instead has reduced the amount of time that these deviations can persist.



*See <https://www.nyse.com/publicdocs/nyse/markets/nyse/PT122812.pdf>

†“The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response,” *Quarterly Journal of Economics* (2015): 1547–1621.

More generally, value additivity implies that the value of a portfolio is equal to the sum of the values of its parts. That is, the “à la carte” price and the package price must coincide.⁷

Value Additivity and Firm Value. Value additivity has an important consequence for the value of an entire firm. The cash flows of the firm are equal to the total cash flows of all projects and investments within the firm. Therefore, by value additivity, the price or value of the entire firm is equal to the sum of the values of all projects and investments within it. In other words, our NPV decision rule coincides with maximizing the value of the entire firm:

To maximize the value of the entire firm, managers should make decisions that maximize NPV. The NPV of the decision represents its contribution to the overall value of the firm.

Where Do We Go from Here?

The key concepts we have developed in this chapter—the Valuation Principle, Net Present Value, and the Law of One Price—provide the foundation for financial decision making. The Law of One Price allows us to determine the value of stocks, bonds, and other securities, based on their cash flows, and validates the optimality of the NPV decision rule in identifying projects and investments that create value. In the remainder of the text, we will build on this foundation and explore the details of applying these principles in practice.

For simplicity, we have focused in this chapter on projects that were not risky, and thus had known costs and benefits. The same fundamental tools of the Valuation Principle and the Law of One Price can be applied to analyze risky investments as well, and we will look in detail at methods to assess and value risk in Part 4 of the text. Those seeking some early insights and key foundations for this topic, however, are strongly encouraged to read the appendix to this chapter. There we introduce the idea that investors are risk averse, and then use the principle of no-arbitrage developed in this chapter to demonstrate two fundamental insights regarding the impact of risk on valuation:

1. When cash flows are risky, we must discount them at a rate equal to the risk-free interest rate plus an appropriate risk premium; and,
2. The appropriate risk premium will be higher the more the project's returns tend to vary with the overall risk in the economy.

Finally, the chapter appendix also addresses the important practical issue of transactions costs. There we show that when purchase and sale prices, or borrowing and lending rates differ, the Law of One Price will continue to hold, but only up to the level of transactions costs.

CONCEPT CHECK

1. If a firm makes an investment that has a positive NPV, how does the value of the firm change?
2. What is the Separation Principle?
3. In addition to trading opportunities, what else do liquid markets provide?

⁷ This feature of financial markets does not hold in many other *noncompetitive* markets. For example, a round-trip airline ticket often costs much less than two separate one-way tickets. Of course, airline tickets are not sold in a competitive market—you cannot buy *and* sell the tickets at the listed prices. Only airlines can sell tickets, and they have strict rules against reselling tickets. Otherwise, you could make money buying round-trip tickets and selling them to people who need one-way tickets.