THE #1 BESTSELLING GUIDE TO
CORPORATE VALUATION

VALUATION

SIXTH 6 EDITION

Measuring and Managing the Value of Companies

TIM KOLLER • MARC GOEDHART • DAVID WESSELS

McKINSEY & COMPANY

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Contents

About the Authors

The authors are all current or former consultants of McKinsey & Company's corporate-finance practice. Collectively they have more than 70 years of experience in consulting and financial education.

Tim Koller is a partner in McKinsey's New York office, where he leads a global team of corporate-finance expert consultants. In his 30 years in consulting, Tim has served clients globally on corporate strategy and capital markets, mergers and acquisitions (M&A) transactions, and value-based management. He leads the firm's research activities in valuation and capital markets. Before joining McKinsey, he worked with Stern Stewart & Company and with Mobil Corporation. He received his MBA from the University of Chicago.

Marc Goedhart is a senior expert in McKinsey's Amsterdam office and leads the firm's Corporate Performance Center in Europe. Over the past 20 years, Marc has served clients across Europe on portfolio restructuring, capital markets, and M&A transactions. He taught finance as an assistant professor at Erasmus University in Rotterdam, where he also earned a PhD in finance.

David Wessels is an adjunct professor of finance at the Wharton School of the University of Pennsylvania. Named by *Bloomberg Businessweek* as one of America's top business school instructors, he teaches courses on corporate valuation and private equity at the MBA and executive MBA levels. David is also a director in Wharton's executive education group, serving on the executive development faculties of several Fortune 500 companies. A former consultant with McKinsey, he received his PhD from the University of California at Los Angeles.

McKinsey & Company is a global management-consulting firm that serves leading businesses, governments, nongovernmental organizations, and not-for-profits across a wide range of industries and functions, helping them make distinctive, lasting, and substantial improvements in performance and realize their most important goals. McKinsey consultants serve clients in every region from a network of over 100 offices in more than 60 countries, advising on topics including strategy, finance, operations, organization, technology, marketing and sales, risk, and sustainability and resource productivity.

Preface

The first edition of this book appeared in 1990, and we are encouraged that it continues to attract readers around the world. We believe the book appeals to readers everywhere because the approach it advocates is grounded in universal economic principles. While we continue to improve, update, and expand the text as our experience grows and as business and finance continue to evolve, those universal principles do not change.

The 25 years since that first edition have been a remarkable period in business history, and managers and investors continue to face opportunities and challenges emerging from it. The events of the economic crisis that began in 2007, as well as the Internet boom and its fallout almost a decade earlier, have strengthened our conviction that the core principles of value creation are general economic rules that continue to apply in all market circumstances. Thus, the extraordinarily high anticipated profits represented by stock prices during the Internet bubble never materialized, because there was no "new economy." Similarly, the extraordinarily high profits seen in the financial sector for the two years preceding the start of the 2007–2009 financial crisis were overstated, as subsequent losses demonstrated. The laws of competition should have alerted investors that those extraordinary profits couldn't last and might not be real.

Over time we have also seen confirmed that for some companies, some of the time, the stock market may not be a reliable indicator of value. Knowing that value signals from the stock market may occasionally be unreliable makes us even more certain that managers need at all times to understand the underlying, intrinsic value of their company and how it can create more value. In our view, clear thinking about valuation and skill in using valuation to guide business decisions are prerequisites for company success.

Today, after six years of sluggish recovery in the United States and stagnation in Europe, calls mount for changes in the nature of shareholder capitalism. We find that the blame for a poorly performing economy should not be placed on the pursuit of shareholder value creation, but on a misguided focus on short-term performance that is inconsistent with the value-creation principles we describe in this book. Creating value for shareholders does not mean pumping up today's share price. It means creating value for the collective of current and future shareholders by applying the techniques explained in this book.

WHY THIS BOOK

Not all CEOs, business managers, and financial managers possess a deep understanding of value, although they need to understand it fully if they are to do their jobs well and fulfill their responsibilities. This book offers them the necessary understanding, and its practical intent reflects its origin as a handbook for McKinsey consultants. We publish it for the benefit of current and future managers who want their companies to create value, and also for their investors. It aims to demystify the field of valuation and to clarify the linkages between strategy and finance. So while it draws on leading-edge academic thinking, it is primarily a how-to book and one we hope you will use again and again. This is no coffee-table tome: if we have done our job well, it will soon be full of underlining, margin notations, and highlighting.

The book's messages are simple: Companies thrive when they create real economic value for their shareholders. Companies create value by investing capital at rates of return that exceed their cost of capital. These two truths apply across time and geography. The book explains why these core principles of value creation are genuine and how companies can increase value by applying them.

The technical chapters of the book aim to explain, step-by-step, how to do valuation well. We spell out valuation frameworks that we use in our consulting work, and we illustrate them with detailed case studies that highlight the practical judgments involved in developing and using valuations. Just as important, the management chapters discuss how to use valuation to make good decisions about courses of action for a company. Specifically, they will help business managers understand how to:

- Decide among alternative business strategies by estimating the value of each strategic choice.
- Develop a corporate portfolio strategy, based on understanding which business units a corporate parent is best positioned to own and which might perform better under someone else's ownership.
- Assess major transactions, including acquisitions, divestitures, and restructurings.
- Improve a company's performance management systems to align the organization's various parts to create value.

- Communicate effectively with investors, including whom to talk with and listen to, and how.
- Design an effective capital structure to support the corporation's strategy and minimize the risk of financial distress.

STRUCTURE OF THE BOOK

In this sixth edition, we continue to expand the practical application of finance to real business problems, reflecting the economic events of the past decade, new developments in academic finance, and the authors' own experiences. The edition is organized in six parts, each with a distinct focus.

Part One, "Foundations of Value," provides an overview of value creation. We make the case that managers should focus on long-term value creation for current and future shareholders, not just some of today's shareholders looking for an immediate pop in the share price. We explain the two core principles of value creation: (1) the idea that return on invested capital and growth drive cash flow, which in turn drives value, and (2) the conservation of value principle, which says that anything that doesn't increase cash flow doesn't create value (unless it reduces risk). We devote a chapter each to return on invested capital and to growth, including strategic principles and empirical insights.

Part Two, "Core Valuation Techniques," is a self-contained handbook for using discounted cash flow (DCF) to value a company. The reader will learn how to analyze historical performance, forecast free cash flows, estimate the appropriate opportunity cost of capital, identify sources of value, and interpret results. We also show how to use multiples of comparable companies to supplement DCF valuations.

Part Three, "Advanced Valuation Techniques," explains how to analyze and incorporate in your valuation such complex issues as taxes, pensions, reserves, inflation, and foreign currency. Part Three also includes a comprehensive case valuing Heineken N.V., the Dutch brewer, illustrating how to apply both the core and advanced valuation techniques.

Part Four, "Managing for Value," applies the value-creation principles to practical decisions that managers face. It explains how to design a portfolio of businesses; how to create value through mergers, acquisitions, and divestitures; how to construct an appropriate capital structure; and how companies can improve their communications with the financial markets.

Part Five, "Special Situations," is devoted to valuation in more complex contexts. It explores the challenges of valuing high-growth companies, companies in emerging markets, cyclical companies, and banks. In addition, it shows how uncertainty and flexibility affect value, and how to apply option-pricing theory and decision trees in valuations.

VALUATION SPREADSHEET

An Excel spreadsheet valuation model is available via Web download. This valuation model is similar to the model we use in practice. Practitioners will find the model easy to use in a variety of situations: mergers and acquisitions, valuing business units for restructuring or value-based management, or testing the implications of major strategic decisions on the value of your company. We accept no responsibility for any decisions based on your inputs to the model. If you would like to purchase the model (ISBN 978-1-118-87366-3 or ISBN 978-1-118-87374-8), please call (800) 225-5945, or visit www.wileyvaluation.com.

Acknowledgments

No book is solely the effort of its authors. This book is certainly no exception, especially since it grew out of the collective work of McKinsey's corporate-finance practice and the experiences of its consultants throughout the world.

Most important, we would like to thank Tom Copeland and Jack Murrin, two of the coauthors of the first three editions of this book. We are deeply indebted to them for establishing the book's early success, for mentoring the current authors, and for their hard work in providing the foundations on which this edition builds.

Ennius Bergsma deserves our special thanks. Ennius initiated the development of McKinsey's corporate-finance practice in the mid-1980s. He inspired the original internal McKinsey valuation handbook and mustered the support and sponsorship to turn that handbook into a real book for an external audience.

Tim and Marc are leaders of McKinsey's Corporate Performance Team, a group of dedicated corporate-finance experts that influences our thinking every day. A special thank-you to Bernie Ferrari, who initiated the group and nurtured its development. The team's leaders include Bing Cao, Susan Nolen Foushee, Abhishek Goel, Anuj Gupta, Mimi James, Mauricio Jaramillo, Bin Jiang, Mary Beth Joyce, David Kohn, Jean-Hugues Monier, Siddharth Periwal, Rishi Raj, Werner Rehm, Abhishek Saxena, Ram Sekar, Anurag Srivastava, and Zane Williams.

We've made extensive use of McKinsey's Corporate Performance Analysis Tool (CPAT), which provides extensive data and the in-depth capital market analysis used in this book. Thank you to Bin Jiang, who developed and oversees CPAT, and to Bing Cao, Ritesh Jain, Saravanan Subramanian, and Angela Zhang, who prepared analyses for us. Dick Foster, a former McKinsey colleague and mentor, inspired the development of CPAT.

Bill Javetski, our lead editor, ensured that our ideas were expressed clearly and concisely. Dennis Swinford edited and oversaw the production of more than 350 exhibits, ensuring that they were carefully aligned with the text. Karen Schenkenfelder provided careful editing and feedback throughout the process. We are indebted to her excellent eye for detail.

Michael Cichello, professor of finance at Georgetown University, expertly prepared many of the teaching materials that accompany this book, including the end of chapter problems and answers for the university edition and exam questions and answers. These teaching materials are an essential supplement for professors and students using this book for finance courses.

Concurrent with the fifth edition, McKinsey published a shorter book, entitled *Value: The Four Cornerstones of Corporate Finance*, which explains the principles of value and their implications for managers and investors without going into the technical detail of this how-to guide. We've greatly benefited from the ideas of that book's coauthors, Richard Dobbs and Bill Huyett, as well as the lead editor, Neil DeCarlo.

The intellectual origins of this book lie in the present-value method of capital budgeting and in the valuation approach developed by Professors Merton Miller and Franco Modigliani (both Nobel laureates) in their 1961 *Journal of Business* article entitled "Dividend Policy, Growth and the Valuation of Shares." Others have gone far to popularize their approach. In particular, Professor Alfred Rappaport (Northwestern University) and Joel Stern (Stern Stewart & Co.) were among the first to extend the Miller-Modigliani enterprise valuation formula to real-world applications. In addition to these founders of the discipline, we would also like to acknowledge those who have personally shaped our knowledge of valuation, corporate finance, and strategy. For their support and teachings, we thank Tony Bernardo, Dick Foster, Bob Holthausen, Rob Kazanjian, Ofer Nemirovsky, Eduardo Schwartz, Chandan Sengupta, Jaap Spronk, Joel Stern, Bennett Stewart, Sunil Wahal, and Ivo Welch.

A number of colleagues worked closely with us on the sixth edition, providing support that was essential to its completion. In Part One, "Foundations of Value," Bill Javetski and Dennis Swinford helped with the always-difficult task of writing the first chapter to position the book properly. Bin Jiang, Bing Cao, Ashaya Jain, Ritesh Jain, and Angela Zhang provided most of the data analysis and insights, which involved crunching large amounts of data. In Part Three, "Advanced Valuation Techniques," Stefan Roos and Abhishek Saxena prepared the analysis for the Heineken case study. In Part Four, "Managing for Value," Werner Rehm and Eileen Kelly Rinaudo contributed to the M&A chapter, André Annema cowrote the divestitures chapter, and Rob Palter and Werner Rehm contributed to the investor communications chapter. In Part Five, "Special Situations," André Annema contributed to the emerging-markets chapter, Zane Williams, Ashish Kumar Agarwal, and Bas Deelder contributed to the chapter on valuing banks, and Marco de Heer's dissertation formed the basis for the chapter on valuing cyclical companies. Angela Zhang provided the analysis for the chapter on valuing high-growth companies. We thank them all for their insights and hard work.

Of course, we could not have devoted the time and energy to this book without the support and encouragement of McKinsey's strategy and corporate-finance practice leadership, in particular Martin Hirt, Bill Huyett, Massimo Giordano, and Robert Uhlaner. Lucia Rahilly and Rik Kirkland ensured that we received superior editorial support from McKinsey's external publishing team.

We would like to thank again all those who contributed to the first five editions. We owe a special debt to Dave Furer for help and late nights developing the original drafts of this book more than 25 years ago. The first five editions and this edition drew upon work, ideas, and analyses from Carlos Abad, Paul Adam, Buford Alexander, Petri Allas, Alexandre Amson, André Annema, the late Pat Anslinger, Vladimir Antikarov, Ali Asghar, Bill Barnett, Dan Bergman, Olivier Berlage, Peter Bisson, the late Joel Bleeke, Nidhi Chadda, Carrie Chen, Steve Coley, Kevin Coyne, Johan Depraetere, Mikel Dodd, Lee Dranikoff, Will Draper, Christian von Drathen, David Ernst, Bill Fallon, George Fenn, Susan Nolen Foushee, Russ Fradin, Gabriel Garcia, Richard Gerards, Alo Ghosh, Irina Grigorenko, Fredrik Gustavsson, Marco de Heer, Keiko Honda, Alice Hu, Régis Huc, Mimi James, Mauricio Jaramillo, Bin Jiang, Chris Jones, William Jones, Phil Keenan, Phil Kholos, David Krieger, Shyanjaw Kuo, Michael Kuritzky, Bill Lewis, Kurt Losert, Harry Markl, Yuri Maslov, Perry Moilinoff, Fabienne Moimaux, Jean-Hugues Monier, Mike Murray, Terence Nahar, Juan Ocampo, Martijn Olthof, Neha Patel, Vijen Patel, John Patience, Bill Pursche, S. R. Rajan, Werner Rehm, Frank Richter, David Rothschild, Michael Rudolf, Yasser Salem, Antoon Schneider, Ram Sekar, Meg Smoot, Silvia Stefini, Konrad Stiglbrunner, Ahmed Taha, Bill Trent, David Twiddy, Valerie Udale, Sandeep Vaswani, Kim Vogel, Jon Weiner, Jack Welch, Gustavo Wigman, David Willensky, Marijn de Wit, Pieter de Wit, Jonathan Witter, David Wright, and Yan Yang.

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Finally, thank you to Melissa Koller, Monique Donders, Kate Wessels, and our children: Katherine, Emily, and Juliana Koller; Maria, Julia, and Sarah Goedhart; and Jacob and Adin Wessels. Our wives and families are our true inspirations. This book would not have been possible without their encouragement, support, and sacrifice.

VALUATION

MEASURING AND MANAGING THE VALUE OF COMPANIES

Part One

Foundations of Value

1

Why Value Value?

The guiding principle of business value creation is a refreshingly simple construct: companies that grow and earn a return on capital that exceeds their cost of capital create value. Articulated as early as 1890 by Alfred Marshall,[1] the concept has stood the test of time. Indeed, when managers, boards of directors, and investors have forgotten it, the consequences have been disastrous. The financial crisis of 2007–2008 and the Great Recession that followed provide the most recent evidence of the point. But a host of other calamities, from the rise and fall of business conglomerates in the 1970s to the collapse of Japan's economy in the 1990s to the Internet bubble, can all to some extent be traced to a misunderstanding or misapplication of this guiding principle.

Today these accumulated crises have led many to call into question the foundations of shareholder-oriented capitalism. Confidence in business has tumbled.[2] Politicians and commentators push for more regulation and fundamental changes in corporate governance. Academics and even some business leaders have called for companies to change their focus from increasing shareholder value to a broader focus on all stakeholders, including customers, employees, suppliers, and local communities. At the extremes, some have gone so far as to argue that companies should bear the responsibility of promoting healthier eating and other social issues.

Many of these impulses are naive. There is no question that the complexity of managing the coalescing and colliding interests of myriad owners and stakeholders in a modern corporation demands that any reform discussion begin with a large dose of humility and tolerance for ambiguity in defining the purpose of business. But we believe the current debate has muddied a fundamental truth: creating shareholder value is not the same as maximizing short-term

[1] Alfred Marshall, *Principles of Economics* (New York: Macmillan, 1890), 1:142.

[2] An annual Gallup poll in the United States showed that the percentage of respondents with little or no confidence in big business increased from 27 percent in the 1983–1986 period to 38 percent in the 2011–2014 period. For more, see Gallup, "Confidence in Institutions," www.gallup.com.

profits. Companies that confuse the two often put both shareholder value and stakeholder interests at risk. Indeed, a system focused on creating shareholder value isn't the problem; short-termism is. Banks that confused the two at the end of the last decade precipitated a financial crisis that ultimately destroyed billions of dollars of shareholder value, as did Enron and WorldCom at the turn of this century. Companies whose short-term focus leads to environmental disasters also destroy shareholder value, not just directly through cleanup costs and fines, but via lingering reputational damage. The best managers don't skimp on safety, don't make value-destroying decisions just because their peers are doing so, and don't use accounting or financial gimmicks to boost short-term profits, because ultimately such moves undermine intrinsic value that is important to shareholders and stakeholders alike.

WHAT DOES IT MEAN TO CREATE SHAREHOLDER VALUE?

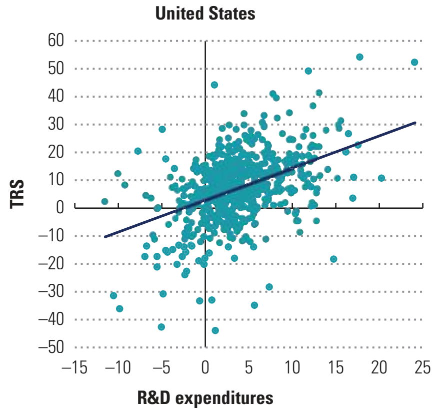
At this time of reflection on the virtues and vices of capitalism, we believe that it's critical that managers and boards of directors have a new, precise definition of shareholder value creation to guide them, rather than having their focus blurred by a vague stakeholder agenda. For today's value-minded executives, creating shareholder value cannot be limited to simply maximizing today's share price for today's shareholders. Rather, the evidence points to a better objective: maximizing a company's collective value to *current and future* shareholders, not just today's.

If investors knew as much about a company as its managers do, maximizing its current share price might be equivalent to maximizing value over time. But in the real world, investors have only a company's published financial results and their own assessment of the quality and integrity of its management team. For large companies, it's difficult even for insiders to know how financial results are generated. Investors in most companies don't know what's really going on inside a company or what decisions managers are making. They can't know, for example, whether the company is improving its margins by finding more efficient ways to work or by simply skimping on product development, maintenance, or marketing.

Since investors don't have complete information, it's easy for companies to pump up their share price in the short term. For example, from 1997 to 2003, a global consumer products company consistently generated annual growth in earnings per share (EPS) between 11 percent and 16 percent. Managers attributed the company's success to improved efficiency. Impressed, investors pushed the company's share price above those of its peers—unaware that the company was shortchanging its investment in product development and brand building to inflate short-term profits, even as revenue growth declined. In 2003, managers had to admit what they'd done. Not surprisingly, the company went through a painful period of rebuilding. Its stock price took years to recover.

EXHIBIT 1.1 **Correlation between TRS and R&D Expenditures**

Compound annual growth rate,[1] 2003–2013, %



[1] Sample includes companies with real revenues greater than $200 million.

This does not mean that the stock market is not "efficient" in the academic sense that it incorporates all public information. Markets do a great job with public information, but markets are not omniscient. Markets cannot price information they don't have. Think about the analogy of selling a house. The seller may know that the boiler makes a weird sound every once in a while or that some of the windows are a bit drafty. Unless the seller discloses those facts, it may be very difficult for a potential buyer to detect them, even with the help of a professional house inspector.

Despite such challenges, the evidence makes it clear that companies with a long strategic horizon create more value. The banks that had the insight and courage to forgo short-term profits during the last decade's real-estate bubble earned much better returns for shareholders over the longer term. Over the long term, oil and gas companies known for investing in safety outperform those that skimp on such investment. We've found, empirically, that long-term revenue growth—particularly organic revenue growth—is the most important driver of shareholder returns for companies with high returns on capital.[3] We've also found that investments in research and development (R&D) correlate powerfully with positive long-term total returns to shareholders (TRS), as graphed in Exhibit 1.1.[4]

[3] B. Jiang and T. Koller, "How to Choose between Growth and ROIC," *McKinsey on Finance*, no. 25 (Autumn 2007), 19–22, www.mckinsey.com. However, we didn't find the same relationship for companies with low returns on capital.

[4] We've performed the same analyses for 15 and 20 years and with different start and end dates and always found similar results.

Creating value for both current and future shareholders means managers should not take actions to increase today's share price if those actions will damage it down the road. Some obvious examples include shortchanging product development, reducing product quality, or skimping on safety. Less obvious examples are making investments that don't take into account likely future changes in regulation or consumer behavior (especially with regard to environmental and health issues). Faced with volatile markets, rapid executive turnover, and intense performance pressures, making long-term value-creating decisions can take courage. But it's management's and the board's task to demonstrate that courage, despite the short-term consequences, in the name of value creation for the collective benefit of all present and future shareholders.

CAN STAKEHOLDER INTERESTS BE RECONCILED?

Much recent criticism of shareholder-oriented capitalism has called on companies to focus on a broader set of stakeholders beyond just its shareholders. It's a view that has long been influential in continental Europe, where it is frequently embedded in corporate governance structures. And we agree that for most companies anywhere in the world, pursuing the creation of long-term shareholder value requires satisfying other stakeholders as well. You can't create long-term value without happy customers, suppliers, and employees.

We would go even further. We believe that companies dedicated to value creation are healthier and more robust—and that investing for sustainable growth also builds stronger economies, higher living standards, and more opportunities for individuals. Our research shows, for example, that many corporate social-responsibility initiatives also create shareholder value, and that managers should seek out such opportunities.[5] For example, IBM's free Web-based resources on business management not only help to build small and mid-size enterprises; they also improve IBM's reputation and relationships in new markets and develop relationships with potential customers.

Similarly, Novo Nordisk's "triple bottom line" philosophy of social responsibility, environmental soundness, and economic viability has led to programs to improve diabetes care in China. Novo Nordisk says such programs have burnished its brand, added to its market share, and increased sales while improving physician education and patient outcomes. Or take Best Buy's efforts to reduce attrition among female employees. Best Buy says the program has not only lowered turnover among women by more than 5 percent, but has also helped female employees create their own support networks and build leadership skills.

[5] S. Bonini, T. Koller, and P. H. Mirvis, "Valuing Social Responsibility Programs," *McKinsey Quarterly* (July 2009), www.mckinsey.com.

But what should be done when a company's interests and those of its stakeholders aren't complementary—for example, in areas such as employee compensation and benefits, supplier management, and local community relationships? Most advocates of a stakeholder-centric approach seem to argue that companies can maximize value for all stakeholders and shareholders simultaneously, without making trade-offs among them. For example, Cornell Law School professor Lynn Stout's book *The Shareholder Value Myth* argues persuasively that nothing in U.S. corporate law requires companies to focus on shareholder value creation.[6] But her argument that putting shareholders first harms nearly everyone is really an argument against short-termism, not a prescription for how to make trade-offs. Similarly, R. Edward Freeman, a professor at the University of Virginia's Darden School of Business, has written at length proposing a stakeholder value orientation. In the recent book *Managing for Stakeholders*, he and his coauthors assert that "there really is no inherent conflict between the interests of financiers and other stakeholders."[7] John Mackey, founder and co-CEO of Whole Foods Market, recently co-wrote *Conscious Capitalism*,[8] in which he too asserts there are no trade-offs to be made.

Such criticism is naive. Strategic decisions often require myriad trade-offs among the interests of different groups that are often at odds with each other. And in the absence of other principled guidelines for such decisions, when there are trade-offs to be made, prioritizing long-term value creation is best for the allocation of resources and the health of the economy.

Consider employee stakeholders. A company that tries to boost profits by providing a shabby work environment, underpaying employees, or skimping on benefits will have trouble attracting and retaining high-quality employees. Lower-quality employees can mean lower-quality products, reduced demand, and damage to the brand reputation. More injury and illness can invite regulatory scrutiny and more union pressure. More turnover will inevitably increase training costs. With today's more mobile and more educated workforce, such a company would struggle in the long term against competitors offering more attractive environments. If the company earns more than its cost of capital, it might afford to pay above-market wages and still prosper, and treating employees well can be good business. But how well is well enough? The stakeholder approach, defined as running the company in a way that treats all stakeholder interests equally, doesn't provide an answer. A shareholder focus does: pay wages that are just enough to attract quality employees and keep them

[6] L. Stout, *The Shareholder Value Myth: How Putting Shareholders First Harms Investors, Corporations, and the Public* (Oakland, CA: Berrett-Koehler, 2012).
[7] R. E. Freeman, J. S. Harrison, and A. C. Wicks, *Managing for Stakeholders: Survival, Reputation, and Success* (New Haven, CT: Yale University Press, 2007), 5.
[8] J. Mackey and R. Sisodia, *Conscious Capitalism: Liberating the Heroic Spirit of Business* (Boston: Harvard Business School Publishing, 2013).

happy and productive, pairing those wages with a range of nonmonetary benefits and rewards. Even companies that have shifted production of products like clothing and textiles to low-cost countries with weak labor protection have found that they need to monitor the working conditions of their suppliers or face a consumer backlash.

Or consider how high a price a company should charge for its products. A shareholder focus would weigh price, volume, and customer satisfaction to determine a price that creates the most shareholder value. However, that price would also have to entice consumers to buy the products—not just once, but multiple times, for different generations of products. A company might still thrive if it charged lower prices, but there's no way to determine whether the value of a lower price is greater for consumers than the value of a higher price to its shareholders.

Consider whether companies in mature, competitive industries should keep open high-cost plants that lose money, just to keep employees working and prevent suppliers from going bankrupt. To do so in a globalizing industry would distort the allocation of resources in the economy, notwithstanding the significant short-term local costs associated with plant closures.[9]

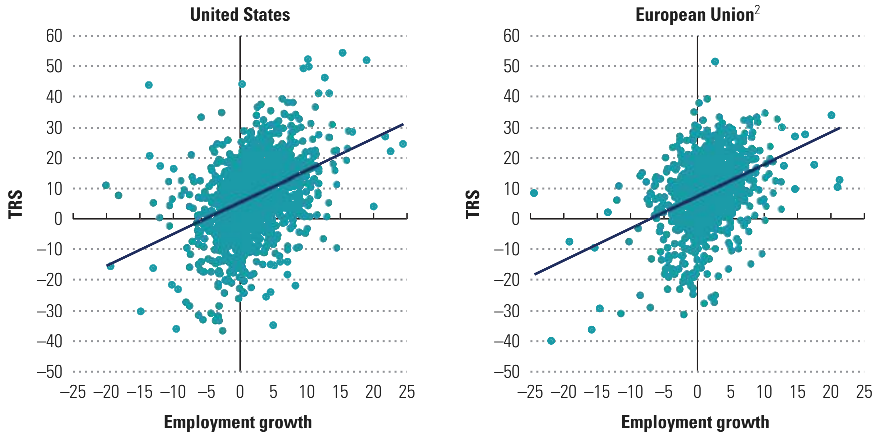
Energy companies have particularly difficult decisions to make. Government energy policy typically toggles between the goals of cost, energy security, and environmental impact. These do not easily line up in a way that makes for smooth integration into energy companies' investment decisions. In practice, the companies need to make careful, balanced judgments around the trade-offs embedded in government policy actions in order to factor them into long-term value-creation strategies. And the greater the policy uncertainty, the harder it is for companies to create long-term value in a way that is good for efficient resource allocation and the health of the economy.

Managers may agonize over decisions that have such a pronounced impact on workers' lives. But consumers benefit when goods are produced at the lowest possible cost, and the economy benefits when unproductive plants are closed and employees move to new jobs with more competitive companies. And while it's true that employees often can't just pick up and relocate, it's also true that value-creating companies create more jobs. When examining employment, we found that the U.S. and European companies that created the most shareholder value in the past 10 years have shown stronger employment growth (see Exhibit 1.2).[10]

[9] Some argue that well-functioning markets also need well-functioning governments to provide the safety nets and retraining support to make essential restructuring processes more equitable.
[10] We've performed the same analyses for 15 and 20 years and with different start and end dates and always found similar results.

EXHIBIT 1.2 **Correlation between TRS and Employment Growth**

Compound annual growth rate,[1] 2003–2013, %



[1] Sample includes companies with real revenues greater than $200 million and excludes outliers with more than 20% employment growth.
[2] Sample includes companies in the core 15 EU member states.

SHAREHOLDER CAPITALISM CANNOT SOLVE ALL SOCIAL ISSUES

There are some trade-offs that company managers can't make and that neither a shareholder nor a stakeholder approach to governance can help. This is especially true when it comes to issues affecting people who aren't immediately involved with the company, as may be the case with investors, customers, and suppliers. These so-called externalities—for example, a company's carbon emissions affecting parties that have no direct contact with the company—are often beyond the ken of corporate decision making because there is no objective basis for making trade-offs among parties.

Consider how this applies to climate change, potentially one of the largest social issues facing the world. One natural place to look for a solution is to reduce coal production used to make electricity, among the largest human-made sources of carbon emissions.[11] But how are the managers of a coal-mining company to make all the trade-offs needed to begin solving our environmental problems? If a long-term shareholder focus led them to anticipate potential regulatory changes, they would modify their investment strategies accordingly—they might not want to open new mines, for example. But if the company abruptly stopped operating existing ones, not only would the company's shareholders lose their entire investment, but so would its bondholders, which are often pension funds. All of the company's employees would

[11] In 2011, coal accounted for 44 percent of the global CO_2 emissions from energy production. International Energy Agency, *CO_2 Emissions from Fuel Combustion*, 2013 ed., www.iea.org.

be out of work, with magnifying effects on the entire local community. Second-order effects would be unpredictable. Without concerted action among all coal producers, another supplier could step up to meet demand. Even with concerted action, power plants might be unable to produce electricity—idling their workers and causing electricity shortages that undermine the economy. What objective criteria would any individual company use to weigh the economic and environmental trade-offs of such decisions—whether they're privileging shareholders or stakeholders?

For their part, longer-term investors, themselves concerned with environmental issues such as carbon emissions, water scarcity, and land degradation, are connecting value and long-term sustainability. In 2014, heirs to the Rockefeller Standard Oil fortune decided to join Stanford University's board of trustees in avoiding shares in coal companies. Long-term-oriented companies must be attuned to long-term changes that will be demanded by both investors and governments, so they can adjust their strategies over a 5-, 10-, or 20-year time horizon and reduce the risk of stranded assets, or those that are still productive but not in use because of environmental or other issues.

For any company, the complexity of addressing universal social issues like climate change poses an unresolved question: if the task does not fall to the individual company, then to whom does it fall? Some might argue that it would be better for the government to develop incentives, regulations, and taxes. In the example of climate change, this view might favor government action to encourage a migration away from polluting sources of energy. Others may espouse a free-market approach, allowing creative destruction to replace aging technologies and systems with cleaner and more efficient sources of power. This trading off of different economic interests and time horizons is precisely what governments are supposed to do, with institutional investors such as pension funds in a critical supporting role. At times, the failure of governments and long-term investors to step up and play their roles effectively can be what leads to the largest divergence between shareholder value creation and the impact of externalities. Failure to price or control for externalities will lead to a misallocation of resources.

Shareholder capitalism has taken its lumps in recent years, no question. Yet we see in our work that the shareholder model, thoughtfully embraced as a collective approach to present and future value creation, is the best one at bridging the broad and varied interests of shareholders and stakeholders alike.

CONSEQUENCES OF FORGETTING VALUE-CREATION PRINCIPLES

When companies forget the simple value-creation principles, the negative consequences to the economy can be huge. Two recent examples of many executives failing in their duty to focus on true value creation are the Internet bubble and the financial crisis of 2008.

During the Internet bubble, managers and investors lost sight of what drove return on invested capital (ROIC); indeed, many forgot the importance of this ratio entirely. Many executives and investors either forgot or threw out fundamental rules of economics in the rarefied air of the Internet revolution. The notion of "winner take all" led companies and investors to believe naively that all that mattered was getting big fast, and that they could worry about creating an effective business model later. Increasing-returns logic was also mistakenly applied to online pet supplies and grocery delivery services, even though these firms had to invest (unsustainably, eventually) in more drivers, trucks, warehouses, and inventory when their customer base grew. When the laws of economics prevailed, as they always do, it was clear that many Internet businesses did not have the unassailable competitive advantages required to earn even modest returns on invested capital. The Internet has revolutionized the economy, as have other innovations, but it did not and could not render obsolete the rules of economics, competition, and value creation.

Similarly, behind the more recent financial and economic crises beginning in 2008 lies the fact that banks and investors forgot the principles of value creation. Banks lent money to individuals and speculators at low teaser rates on the assumption that house prices would only increase. Banks packaged these high-risk debts into long-term securities and sold them to investors who used short-term debt to finance the purchase, thus creating a long-term risk for whoever lent them the money. When the home buyers could no longer afford the payments, the real estate market crashed, pushing the values of many homes below the values of loans taken out to buy them. At that point, homeowners could neither make the required payments nor sell their houses. Seeing this, the banks that had issued short-term loans to investors in securities backed by mortgages became unwilling to roll over those loans, prompting the investors to sell all such securities at once. The value of the securities plummeted. Finally, many of the large banks themselves owned these securities, which they, of course, had also financed with short-term debt they could no longer roll over.

In the past 30 years, the world has seen at least six financial crises that arose largely because companies and banks were financing illiquid assets with short-term debt: the U.S. savings and loan catastrophe in the 1980s, the East Asian debt crisis in the mid-1990s, the Russian government default in 1998, the collapse in that same year of the U.S. hedge fund Long-Term Capital Management, the U.S. commercial real estate crisis in the early 1990s, and the Japanese financial crisis that began in 1990 and, according to some, continues to this day.

SHORT-TERMISM RUNS DEEP

One of the causes of these economic calamities is the short-termism of many companies. What is most relevant about Stout's argument and that of others is its implicit criticism of short-termism. It is a fair critique of today's capitalism. Despite overwhelming evidence linking intrinsic investor preferences to long-term value creation,[12] too many managers continue to plan and execute strategy—and then report their performance—against shorter-term measures, particularly earnings per share (EPS).

As a result of their focus on short-term EPS, major companies often pass up value-creating opportunities. In a survey of 400 chief financial officers, two Duke University professors found that fully 80 percent of the CFOs said they would reduce discretionary spending on potentially value-creating activities such as marketing and R&D in order to meet their short-term earnings targets.[13] In addition, 39 percent said they would give discounts to customers to make purchases this quarter rather than next, in order to hit quarterly EPS targets. Such biases shortchange all stakeholders.

As an illustration of how executives get caught up in a short-term EPS focus, consider our experience with companies analyzing a prospective acquisition. The most frequent question managers ask is whether the transaction will dilute EPS over the first year or two. Given the popularity of EPS as a yardstick for company decisions, you might think that a predicted improvement in EPS would be an important indication of an acquisition's potential to create value. However, there is no empirical evidence linking increased EPS with the value created by a transaction.[14] Deals that strengthen EPS and deals that dilute EPS are equally likely to create or destroy value.

If such fallacies have no impact on value, why do they prevail? The impetus for a short-termism varies. Some executives argue that investors won't let them focus on the long term; others fault the rise of shareholder activists in particular. Yet our research shows that even if short-term investors cause day-to-day fluctuations in a company's share price and dominate quarterly earnings calls, longer-term investors are the ones who align market prices with intrinsic value.[15] Moreover, the evidence shows that, on average, activist investors strengthen the long-term health of the companies they pursue—for example, often challenging existing compensation structures that encourage short-termism.[16] Instead, we often find that executives themselves or their boards are usually the source of short-termism. In a 2013 survey of more than 1,000 executives and board members, most cited their own executive teams and boards

[12] R. N. Palter, W. Rehm, and J. Shih, "Communicating with the Right Investors," *McKinsey Quarterly* (April 2008), www.mckinsey.com.
[13] J. R. Graham, C. R. Harvey, and S. Rajgopal, "Value Destruction and Financial Reporting Decisions," *Financial Analysts Journal* 62, no. 6 (2006): 27–39.
[14] R. Dobbs, B. Nand, and W. Rehm, "Merger Valuation: Time to Jettison EPS," *McKinsey Quarterly* (March 2005), www.mckinsey.com.
[15] Palter, Rehm, and Shih, "Communicating with the Right Investors."
[16] J. Cyriac, R. De Backer, and J. Sanders, "Preparing for Bigger, Bolder Shareholder Activists," *McKinsey on Finance* (March 2014), www.mckinsey.com.

(rather than investors, analysts, and others outside the company) as the greatest sources of pressure for short-term performance.[17]

The results can defy logic. At a company pursuing a major acquisition, we participated in a discussion about whether the deal's likely earnings dilution was important. One of the company's bankers opined that he knew any impact on EPS would be irrelevant to value, but he used it as a simple way to communicate with boards of directors. Elsewhere, we've heard company executives acknowledge that they, too, doubt that the impact on EPS is so important—but they also use it anyway, "for the benefit of Wall Street analysts." Investors also tell us that a deal's short-term impact on EPS is not that important. Apparently everyone knows that a transaction's short-term impact on EPS doesn't matter, yet they all pay attention to it.

The pressure to show strong short-term results often mounts when businesses start to mature and see their growth begin to moderate. Investors go on baying for high growth. Managers are tempted to find ways to keep profits rising in the short term while they try to stimulate longer-term growth. However, any short-term efforts to massage earnings that undercut productive investment make achieving long-term growth even more difficult, spawning a vicious circle.

Some analysts and some short-term-oriented investors will always clamor for short-term results. However, even though a company bent on growing long-term value will not be able to meet their demands all of the time, this continuous pressure has the virtue of keeping managers on their toes. Sorting out the trade-offs between short-term earnings and long-term value creation is part of a manager's job, just as having the courage to make the right call is a critical personal quality. Perhaps even more important, it is up to corporate boards to investigate and understand the economics of the businesses in their portfolio well enough to judge when managers are making the right trade-offs and, above all, to protect managers when they choose to build long-term value at the expense of short-term profits.

Changes in corporate governance might help. Board members might be required to spend more time on their board activities, so they have a better understanding of the economics of the companies they oversee and the strategic and short-term decisions managers are making. In a survey of 20 UK board members who had served on the boards of both exchange-listed companies and companies owned by private-equity firms, 15 of 20 respondents said that

[17]Commissioned by McKinsey & Company and by the Canada Pension Plan Investment Board, the online survey, "Looking toward the Long Term," was in the field from April 30 to May 10, 2013, and garnered responses from 1,038 executives representing the full range of industries and company sizes globally. Of these respondents, 722 identified themselves as C-level executives and answered questions in the context of that role, and 316 identified themselves as board directors and answered accordingly. To adjust for differences in response rates, the data are weighted by the contribution of each respondent's nation to global gross domestic product (GDP). For more, see "Focusing Capital on the Long Term," www.fclt.org.

private-equity boards clearly added more value. Their answers suggested two key differences. First, listed-company directors are more focused on risk avoidance than value creation. Second, private-equity directors spend on average nearly three times as many days on their roles as do those at listed companies.[18] Changes in CEO evaluation and compensation might also help. The compensation of most CEOs and senior executives is still skewed to short-term accounting profits, often by formula. Given the complexity of managing a large multinational company, we find it odd that so much weight is given to a single number.

THIS BOOK

This book is a guide to how to measure and manage the value of a company. The faster companies can increase their revenues and deploy more capital at attractive rates of return, the more value they create. The combination of growth and return on invested capital (ROIC), relative to its cost, is what drives value. Anything that doesn't increase cash flows doesn't create value. This category can include steps that change the ownership of claims to cash flows, and accounting techniques that may change the timing of profits without actually changing cash flows.

This guiding principle of value creation links directly to competitive advantage, the core concept of business strategy. Only if companies have a well-defined competitive advantage can they sustain strong growth and high returns on invested capital. To the core principles, we add the empirical observation that creating sustainable value is a long-term endeavor, one that needs to take into account wider social, environmental, technological, and regulatory trends.

Competition tends to erode competitive advantages and, with them, returns on invested capital. Therefore, companies must continually seek and exploit new sources of competitive advantage if they are to create long-term value. To that end, managers must resist short-term pressure to take actions that create illusory value quickly at the expense of the real thing in the long term. Creating value for shareholders is not the same as, for example, meeting the analysts' consensus earnings forecast for the next quarter. Nor is it ignoring the effects of decisions made today that may create greater costs down the road, from environmental cleanup to retrofitting plants to meet future pollution regulations. It means balancing near-term financial performance against what it takes to develop a healthy company that can create value for decades ahead—a demanding challenge.

[18]V. Acharya, C. Kehoe, and M. Reyner, "The Voice of Experience: Public versus Private Equity," *McKinsey on Finance* (Spring 2009): 16–21.

This book explains both the economics of value creation (for instance, how competitive advantage enables some companies to earn higher returns on invested capital than others) and the process of measuring value (for example, how to calculate return on invested capital from a company's accounting statements). With this knowledge, companies can make wiser strategic and operating decisions, such as what businesses to own and how to make trade-offs between growth and return on invested capital. Equally, this knowledge will enable investors to calculate the risks and returns of their investments with greater confidence.

Applying the principles of value creation sometimes means going against the crowd. It means accepting that there are no free lunches. It means relying on data, thoughtful analysis, and a deep understanding of the competitive dynamics of your industry. We hope this book provides readers with the knowledge to help them make and defend decisions that will create value for investors and for society at large throughout their careers.

2

Fundamental Principles of Value Creation

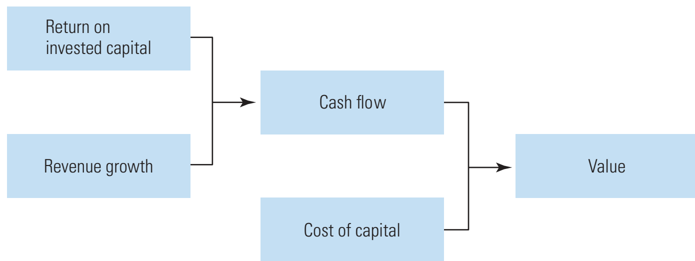
Companies create value for their owners by investing cash now to generate more cash in the future. The amount of value they create is the difference between cash inflows and the cost of the investments made, adjusted to reflect the fact that tomorrow's cash flows are worth less than today's because of the time value of money and the riskiness of future cash flows. As we will demonstrate, a company's return on invested capital (ROIC)[1] and its revenue growth together determine how revenues are converted to cash flows (and earnings). That means the amount of value a company creates is governed ultimately by its ROIC, revenue growth, and ability to sustain both over time. Keep in mind one important caveat: a company will create value only if its ROIC is greater than its cost of capital (the opportunity cost for its investors). Moreover, only if ROIC exceeds cost of capital will growth increase a company's value. Growth at lower returns actually reduces a company's value. Exhibit 2.1 illustrates this core principle of value creation.[2]

Following these principles helps managers decide which investments will create the most value for shareholders in the long term. The principles also help investors assess the potential value of companies they might consider investing in. This chapter explains the relationships that tie together growth, ROIC, cash flows, and value, and it introduces the way managers can use these

[1] A simple definition of return on invested capital is after-tax operating profit divided by invested capital (working capital plus fixed assets). ROIC's calculation from a company's financial statements is explained in detail in Chapter 9.

[2] In its purest form, *value* is the sum of the present values of future expected cash flows—a point-in-time measure. *Value creation* is the change in value due to company performance (changes in growth and ROIC). Sometimes we refer to value and value creation based on explicit projections of future growth, ROIC, and cash flows. At other times, we use the market price of a company's shares as a proxy for value, and total returns to shareholders (share price appreciation plus dividends) as a proxy for value creation.

EXHIBIT 2.1 **Growth and ROIC Drive Value**



relationships to decide among different investments or strategies. For example, we will show that high-ROIC companies typically create more value by focusing on growth, while lower-ROIC companies create more value by increasing ROIC.

One might expect universal agreement on a notion as fundamental as value, but this isn't the case: many executives, boards, and financial media still treat accounting earnings and value as one and the same, and focus almost obsessively on improving earnings. However, while earnings and cash flow are often correlated, earnings don't tell the whole story of value creation, and focusing too much on earnings or earnings growth often leads companies to stray from a value-creating path.

For example, earnings growth alone can't explain why investors in drugstore chain Walgreen Co., with sales of $72 billion in 2012, and consumer products company General Mills, with sales of $18 billion the same year, earned similar shareholder returns between 1985 and 2012.[3] These two successful companies had very different growth rates. During the period, after-tax operating profits for Walgreens grew 13 percent per year, while those of General Mills grew 9 percent annually. This means that profits for Walgreens in 2012 were 25 times larger than in 1985, while profits at General Mills were only 9 times larger. Even though Walgreens was one of the fastest-growing companies in the United States during this time, its average annual shareholder returns were 10 percent, about the same as for the significantly slower-growing General Mills. The reason General Mills could create the same value as Walgreens, despite 30 percent slower growth, was that General Mills earned a 29 percent ROIC, while the ROIC for Walgreens was 16 percent (a good rate for a retailer).

To be fair, if all companies in an industry earned the same ROIC, then earnings growth *would* be the differentiating metric. For reasons of simplicity, analysts and academics have sometimes made this assumption, but as Chapter 6 demonstrates, returns on invested capital can vary considerably, not only across industries but also between companies within the same industry.

[3]Shareholder returns equal dividends plus appreciation in the share price.

THE RELATIONSHIP OF GROWTH, ROIC, AND CASH FLOW

Disaggregating cash flow into revenue growth and ROIC helps illuminate the underlying drivers of a company's performance. Say a company's cash flow was $100 last year and will be $150 next year. This doesn't tell us much about its economic performance, since the $50 increase in cash flow could come from many sources, including revenue growth, a reduction in capital spending, or a reduction in marketing expenditures. But if we told you that the company was generating revenue growth of 7 percent per year and would earn a return on invested capital of 15 percent, then you would be able to evaluate its performance. You could, for instance, compare the company's growth rate with the growth rate of its industry or the economy, and you could analyze its ROIC relative to peers, its cost of capital, and its own historical performance.

Growth, ROIC, and cash flow are mathematically linked. To see how, consider two companies, Value Inc. and Volume Inc., whose projected earnings, investment, and resulting cash flows are displayed in Exhibit 2.2. Both companies earned $100 million in year 1 and increased their revenues and earnings at 5 percent per year, so their projected earnings are identical. If the popular view that value depends only on earnings were true, the two companies' values also would be the same. But this simple example illustrates how wrong that view can be.

Value Inc. generates higher cash flows with the same earnings because it invests only 25 percent of its profits (making its investment rate 25 percent) to achieve the same profit growth as Volume Inc., which invests 50 percent of its profits. Value Inc.'s lower investment rate results in 50 percent higher cash flows than at Volume Inc. while generating the same level of profits.

We can value the two companies by discounting their future cash flows at a discount rate that reflects what investors expect to earn from investing in the companies—that is, their cost of capital. For both companies, we discounted each year's cash flow to the present at a 10 percent cost of capital and summed the results to derive a total present value of all future cash flows: $1,500 million for Value Inc. (shown in Exhibit 2.3) and $1,000 million for Volume Inc.

EXHIBIT 2.2 **Tale of Two Companies: Same Earnings, Different Cash Flows**

$ million

	Value Inc.					Volume Inc.				
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues	1,000	1,050	1,102	1,158	1,216	1,000	1,050	1,102	1,158	1,216
Earnings	100	105	110	116	122	100	105	110	116	122
Investment	(25)	(26)	(28)	(29)	(31)	(50)	(53)	(55)	(58)	(61)
Cash flow	75	79	82	87	91	50	52	55	58	61

EXHIBIT 2.3 **Value Inc.: DCF Valuation**

$ million

	Value Inc.						
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year X**	**Sum**
Earnings	100	105	110	116	122	. . .	–
Investment	(25)	(26)	(28)	(29)	(31)	. . .	–
Cash flow	75	79	82	87	91	. . .	–
Value today	68	65	62	59	56	. . .	1,500

Present value of 75 discounted at 10% for one year

Present value of 87 discounted at 10% for four years

The companies' values can also be expressed as price-to-earnings ratios (P/Es). To do this, divide each company's value by its first-year earnings of $100 million. Value Inc.'s P/E is 15, while Volume Inc.'s is only 10. Despite identical earnings and growth rates, the companies have different earnings multiples because their cash flows are so different. Value Inc. generates higher cash flows because it doesn't have to invest as much as Volume Inc., thanks to its higher rate of ROIC. In this case, Value Inc. invested $25 million (out of $100 million earned) in year 1 to increase its profits by $5 million in year 2. Its return on new capital is 20 percent ($5 million of additional profits divided by $25 million of investment).[4] In contrast, Volume Inc.'s return on invested capital is 10 percent ($5 million in additional profits in year 2 divided by an investment of $50 million).

Growth, ROIC, and cash flow (as represented by the investment rate) are tied together mathematically in the following relationship:

$$\text{Growth} = \text{ROIC} \times \text{Investment Rate}$$

Applying the formula to Value Inc.:

$$5\% = 20\% \times 25\%$$

Applying it to Volume Inc.:

$$5\% = 10\% \times 50\%$$

As you can see, Volume Inc. needs a higher investment rate to achieve the same growth.

[4] We assumed that all of the increase in profits is due to the new investment, with the return on Value Inc.'s existing capital remaining unchanged.

Another way to look at this comparison is in terms of cash flow:

$$\text{Cash Flow} = \text{Earnings} \times (1 - \text{Investment Rate})$$

where

$$\text{Investment Rate} = \text{Growth/ROIC})$$

So:

$$\text{Cash Flow} = \text{Earnings} \times (1 - \text{Growth/ROIC})$$

For Value Inc.:

$$\begin{aligned}\$75 &= \$100 \times (1 - 5\%/20\%)\\ &= \$100 \times (1 - 25\%)\end{aligned}$$

For Volume Inc.:

$$\begin{aligned}\$50 &= \$100 \times (1 - 5\%/10\%)\\ &= \$100 \times (1 - 50\%)\end{aligned}$$

Since the three variables are tied together mathematically, you can describe a company's performance with any two variables. We generally describe a company's performance in terms of growth and ROIC because, as mentioned earlier, you can analyze growth and ROIC across time and versus peers.

Note that near-term cash flow itself may not be a meaningful performance indicator. Consider what would happen if Value Inc. were to find more investment opportunities at a 25 percent ROIC and be able to increase its growth to 8 percent per year. Exhibit 2.4 shows the projected earnings and cash flow. Because it would be growing faster, Value Inc. would need to invest more of its earnings each year, so its cash flow at 8 percent growth would be lower than at 5 percent growth until year 9. However, its value at 8 percent growth would double, to $3,000 million, because its cash flows are higher in the long term.

EXHIBIT 2.4 **Value, Inc.: Lower Initial Cash Flow at Higher Growth Rate**

5% growth

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Earnings	100	105	110	116	122	128	138	141	148	155	163	171
Net investment	(25)	(26)	(28)	(29)	(30)	(32)	(34)	(35)	(37)	(39)	(41)	(43)
Cash flow	75	79	83	87	91	96	101	106	111	116	122	128

8% growth

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Earnings	100	108	117	126	136	147	159	171	185	200	216	233
Net investment	(40)	(43)	(47)	(50)	(54)	(59)	(63)	(69)	(74)	(80)	(86)	(93)
Cash flow	60	65	70	76	82	88	95	103	111	120	130	140

Higher growth rate initially generates less cash flow

EXHIBIT 2.5 **Translating Growth and ROIC into Value**

Value,[1] $

Growth \ ROIC	7%	9%	13%	25%
3%	800	1,100	1,400	1,600
6%	600	1,100	1,600	2,100
9%	400	1,100	1,900	2,700

[1] Present value of future cash flows, assuming year 1 earnings of $100 and a 9% cost of capital. After 15 years, all scenarios grow at 4.5%.

BALANCING ROIC AND GROWTH TO CREATE VALUE

Exhibit 2.5 shows how different combinations of growth and ROIC translate into value. Each cell in the matrix represents the present value of future cash flows under each of the assumptions of growth and ROIC, discounted at the company's cost of capital—in this case, assuming a 9 percent cost of capital and a company that earns $100 in the first year.[5]

Observe that for any level of growth, value increases with improvements in ROIC. In other words, when all else is equal, a higher ROIC is always good. The same can't be said of growth. When ROIC is high, faster growth increases value. But when ROIC is lower than the company's cost of capital, faster growth destroys value. When return on capital is lower than the cost of capital, growing faster means investing more at a value-destroying return. Where ROIC equals the cost of capital, we can draw the dividing line between creating and destroying value through growth. On that line, value is neither created nor destroyed, regardless of how fast the company grows. It's as if management were on a treadmill. They're working hard, but after their workout, they are right where they started.

From the exhibit, you can also see that a company with high ROIC and low growth may have a similar or higher valuation multiple than a company with higher growth but low ROIC. For example, at the end of 2013,

[5]We made explicit cash flow forecasts for the first 15 years and assumed that growth after that point converges on 4.5 percent in all scenarios. If a company grew faster than the economy forever, it would eventually overtake the entire world economy.

Colgate-Palmolive, the global consumer products company, and Costco, the second-largest U.S. retailer, both were valued with a ratio of enterprise value to after-tax operating profits in the range of 21 to 22 times. Yet Costco had been growing at 10 percent per year over the prior three years, while Colgate-Palmolive had grown at only 4 percent per year. Colgate-Palmolive made up for its lower growth with a higher ROIC of 34 percent, versus 17 percent for Costco (which is good for a capital-intensive, low-margin retailer).

We sometimes hear the argument that even low-ROIC companies should strive for growth. The logic is that if a company grows, its ROIC will naturally increase. However, we find this is true only for young, start-up businesses. Most often in mature companies, a low ROIC indicates a flawed business model or unattractive industry structure. Don't fall for the trap that growth will lead to scale economies that automatically increase a company's return on capital. It almost never happens for mature businesses.

REAL-WORLD EXAMPLES

The logic laid out in this section is reflected in the way companies perform in the stock market. Recall the earlier explanation of why shareholder returns for Walgreens and General Mills were the same even though earnings for Walgreens grew much faster. Rockwell Automation provides another example of the relative impact of growth and ROIC on value. Rockwell provides integrated systems to monitor and control automation in factories. Rockwell's total returns to shareholders (TRS) from 1995 to 2013 were 15 percent per year, placing it in the top quartile of industrial companies. During this period, Rockwell's revenues actually shrank an average of 4 percent per year as it divested its aviation and power systems divisions. The major factor behind its high TRS was its success in increasing ROIC, from about 12 percent in the mid-1990s to about 32 percent in 2013 (including goodwill). After spinning off its aviation business (now known as Rockwell Collins) in 2001, Rockwell focused on its core industrial-automation business and improved ROIC significantly. While this was partially accomplished by divesting lower-margin ancillary businesses, the majority of the improvement came from operational improvement in industrial automation. The company publicly reiterated its focus on cost and capital productivity many times during the period.

Clearly, the core valuation principle applies at the company level. We have found that it applies at the sector level, too. Consider companies as a whole in the consumer packaged-goods sector. Even though well-known names in the sector such as Procter & Gamble and Colgate-Palmolive aren't high-growth companies, the market values them at average earnings multiples because of their high returns on invested capital.

The typical large packaged-goods company increased its revenues 4 percent a year from 2009 to 2013, slower than the average of about 7 percent for all

Standard & Poor's (S&P) 500 companies (excluding financial institutions). Yet at the end of 2013, the median P/E of consumer packaged-goods companies was about 17, almost exactly the same as the median S&P 500 company. The valuations of companies in this sector rested on their high ROICs—in aggregate above 40 percent, compared with an aggregate ROIC of 20 percent for the S&P 500 from 2009 to 2013.

To test whether the core valuation principle also applies at the level of countries and the aggregate economy, we asked why large U.S.-based companies typically trade at higher multiples than large companies in Asia's more developed countries of Japan, Hong Kong, South Korea, Taiwan, and Singapore. For example, the trailing P/E ratio for the largest 500 companies in these markets at year-end 2013 was 16 times, versus 21 for U.S. companies. The difference in valuation relative to invested capital is even more extreme. In these Asian companies, the median enterprise value to invested capital was 1.4 times, versus 2.9 for U.S. companies. Some executives assume the reason is that investors are simply willing to pay higher prices for shares of U.S. companies (an assumption that has prompted some non-U.S. companies to consider moving their share listings to the New York Stock Exchange in an attempt to increase their value). But the real reason U.S. companies trade at higher multiples is that they typically earn higher returns on invested capital. The median large U.S. company earned a 19 percent ROIC in 2013, while the median large Asian company earned 8 percent. Of course, these broad comparisons hide the fact that some Asian sectors and companies—for example, Taiwan Semiconductor, a global leader in semiconductor manufacturing—outperform their U.S. counterparts. But for the most part, Asian companies historically have focused more on growth than profitability or ROIC, which explains the large difference between their average valuation and that of U.S. companies.

More evidence showing that ROIC and growth drive value is presented in Chapter 5.

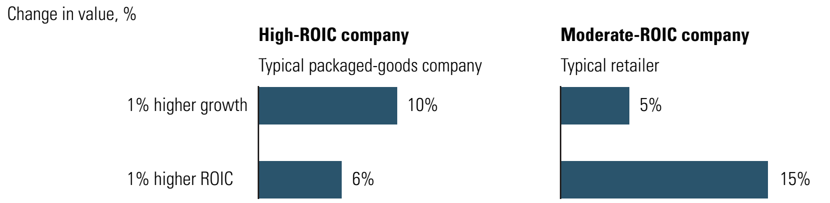
MANAGERIAL IMPLICATIONS

We'll dive deeper into the managerial dimensions of ROIC and growth in Chapters 6 and 7, respectively. For now, we outline several lessons managers should learn for strategic decision making.

Start by referring back to Exhibit 2.5, because it contains the most important strategic insights for managers concerning the relative impact that changes in ROIC and growth can have on a company's value. In general, companies already earning a high ROIC can generate more additional value by increasing their rate of growth, rather than their ROIC. For their part, low-ROIC companies will generate relatively more value by focusing on increasing their ROIC.

For example, Exhibit 2.6 shows that a typical high-ROIC company, such as a branded consumer packaged-goods company, can increase its value by

EXHIBIT 2.6 **Increasing Value: Impact of Higher Growth and ROIC**



10 percent if it increases its growth rate by one percentage point, while a typical moderate-ROIC company, such as the average retailer, will increase its value by only 5 percent for the same increase in growth. In contrast, the moderate-ROIC company gets a 15 percent bump in value from increasing its return on invested capital by one percentage point, while the high-ROIC company gets only a 6 percent bump from the same increase in return on invested capital.

The general lesson is that high-ROIC companies should focus on growth, while low-ROIC companies should focus on improving returns before growing. Of course, this analysis assumes that achieving a one-percentage-point increase in growth is as easy as achieving a one-percentage-point increase in ROIC, everything else being constant. In reality, achieving either type of increase poses different degrees of difficulty for different companies in different industries, and the impact of a change in growth and ROIC will also vary between companies. However, every company needs to make the analysis in order to set its strategic priorities.

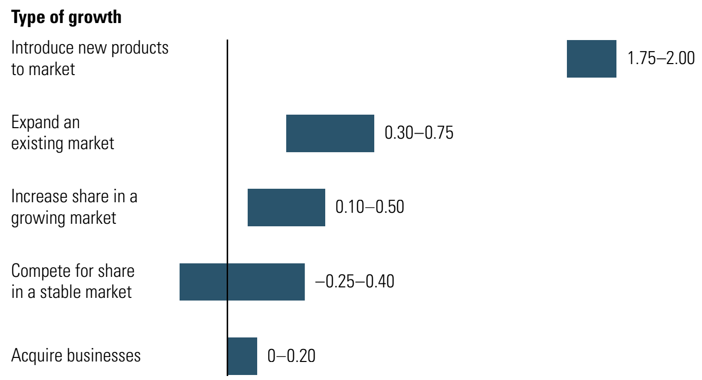
Until now, we have assumed that all growth earns the same ROIC and therefore generates the same value, but this is clearly unrealistic: different types of growth earn different returns on capital, so not all growth is equally value-creating. Each company must understand the pecking order of growth-related value creation that applies to its industry and company type.

Exhibit 2.7 shows the value created from different types of growth for a typical consumer products company. These results are based on cases with which we are familiar, not on a comprehensive analysis. Still, we believe they reflect the broader reality.[6] The results are expressed in terms of value created for \$1.00 of incremental revenue. For example, \$1.00 of additional revenue from a new product creates \$1.75 to \$2.00 of value. The most important implication of this chart is the rank order. New products typically create more value for shareholders, while acquisitions typically create the least. The key to the difference between these extremes is differences in ROICs for the different types of growth.

[6] We identified examples for each type of growth and estimated their impact on value creation. For instance, we obtained several examples of the margins and capital requirements for new products.

EXHIBIT 2.7 **Value Creation by Type of Growth**

Shareholder value created for incremental $1.00 of revenue, $[1]



[1] Value for a typical consumer packaged-goods company.

Growth strategies based on organic new-product development frequently have the highest returns because they don't require much new capital; companies can add new products to their existing factory lines and distribution systems. Furthermore, the investments to produce new products are not all required at once. If preliminary results are not promising, future investments can be scaled back or canceled.

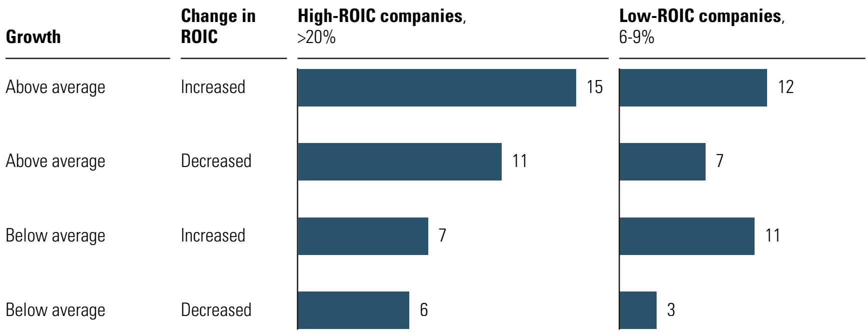
Acquisitions, by contrast, require that the entire investment be made up front. The amount of up-front payment reflects the expected cash flows from the target plus a premium to stave off other bidders. So even if the buyer can improve the target enough to generate an attractive ROIC, the rate of return is typically only a small amount higher than its cost of capital.

To be fair, this analysis doesn't reflect the risk of failure. Most product ideas fail before reaching the market, and the cost of failed ideas is not reflected in the numbers. By contrast, acquisitions typically bring existing revenues and cash flows that limit the downside risk to the acquirer. But including the risk of failure would not change the pecking order of investments from a value-creation viewpoint.

The interaction between growth and ROIC is a key factor to consider when assessing the likely impact of a particular investment on a company's overall ROIC. For example, we've found that some very successful, high-ROIC companies in the United States are reluctant to invest in growth if it will reduce their ROICs. One technology company had a 30 percent operating margin and ROIC of more than 50 percent, so it didn't want to invest in projects that might earn only 25 percent returns, fearing this would dilute its average returns. But as the first principle of value creation would lead you to expect, even an opportunity with a 25 percent return would still create value as long as the cost of capital was lower, despite the resulting decline in average ROIC.

EXHIBIT 2.8 **Impact of Growth and ROIC on High- and Low-ROIC Companies**

Annualized TRS, 1996–2005, %



Source: Bin Jiang and Tim Koller, "How to Choose between Growth and ROIC," *McKinsey on Finance*, no. 25 (Autumn 2007): 19–22.

The evidence backs this up. We examined the performance of 78 high-ROIC companies (with greater than 30 percent ROIC) from 1996 to 2005.[7] Not surprisingly, the companies that created the most value (measured by total returns to shareholders over the 10 years) were those that grew fastest and maintained their high ROICs (see Exhibit 2.8). But the second-highest value creators were those that grew fastest even though they experienced moderate declines in their ROICs. They created more value than companies that increased their ROICs but grew slowly.

We've also seen companies with low returns pursue growth on the assumption that this will also improve their profit margins and returns, reasoning that growth will increase returns by spreading fixed costs across more revenues. As we mentioned earlier in this chapter, however, except at small start-up companies, faster growth rarely fixes a company's ROIC problem. Low returns usually indicate a poor industry structure (e.g., airlines), a flawed business model, or weak execution. If a company has a problem with ROIC, the company shouldn't grow until the problem is fixed.

The evidence backs this up as well. We examined the performance of 64 low-ROIC companies from 1996 to 2005 (the right column in Exhibit 2.8). The companies that had low growth but increased their ROICs outperformed the faster-growing companies that did not improve their ROICs.

One final factor for management to consider is the method by which it chooses to improve ROIC. A company can increase ROIC by either improving profit margins or improving capital productivity. With respect to future growth, it doesn't matter which of these paths you emphasize. But for current operations, at moderate ROIC levels, a 1 percent increase in ROIC through

[7] Bin Jiang and Timothy Koller, "How to Choose between Growth and ROIC," *McKinsey on Finance*, no. 25 (Autumn 2007): 19–22.

margin improvement will have a moderately higher impact on value relative to improving capital productivity. At high levels of ROIC, though, improving ROIC by increasing margins will create much more value than an equivalent ROIC increase by improving capital productivity.

Consider a company with zero growth, $1,000 of revenues, $100 of profits, and $500 of invested capital (translating to a 10 percent margin, a 50 percent ratio of invested capital to revenues, and ROIC of 20 percent). One way to increase ROIC by 1 percent is to increase profits by $5 (improving the margin to 10.5 percent). Since the company is not growing, the $5 of extra profits translates to $5 of cash flow each year going forward. Discounting at 10 percent cost of capital, this represents a $50 increase in value. The company could also increase ROIC by reducing working capital. If it reduced working capital by $24, ROIC would increase to 21 percent ($100 divided by $476). The company's value would increase by the one-time cash inflow from reducing working capital of $24. Future cash flows would not be affected.

ECONOMIC PROFIT COMBINES ROIC AND SIZE

You can also measure a company's value creation using economic profit, a measure that combines ROIC and size into a currency metric (here we use the U.S. dollar). Economic profit measures the value created by a company in a single period and is defined as follows:

$$\text{Economic Profit} = \text{Invested Capital} \times (\text{ROIC} - \text{Cost of Capital})$$

In other words, economic profit is the spread between the return on invested capital and the cost of capital times the amount of invested capital. Value Inc.'s economic profit for year 1 is $50 (Value Inc. must have $500 of starting capital if it earns $100 at a 20 percent return in year 1):

$$\begin{aligned}\text{Economic Profit} &= \$500 \times (20\% - 10\%)\\ &= \$500 \times 10\%\\ &= \$50\end{aligned}$$

Volume Inc.'s economic profit in year 1 is zero (Volume Inc. must have $1,000 of starting capital if it earns $100 at a 10 percent return in year 1):

$$\begin{aligned}\text{Economic Profit} &= \$1,000 \times (10\% - 10\%)\\ &= \$1,000 \times 0\%\\ &= \$0\end{aligned}$$

You can also value a company by discounting its projected economic profit at the cost of capital and adding the starting invested capital. Value Inc. starts with \$500 of invested capital. Its economic profit in year 1 is \$50, which grows at 5 percent. Discounting the growing economic profit at a 10 percent discount rate gives a present value of economic profit of \$1,000:[8]

$$
\begin{aligned}
\text{Value} &= \text{Starting Invested Capital} + \text{PV of Projected Economic Profit} \\
&= \$500 + \$1,000 \\
&= \$1,500
\end{aligned}
$$

The value of Value Inc. using the economic-profit approach is \$1,500, exactly the same as with the discounted-cash-flow (DCF) approach.

Economic profit is also useful for comparing the value creation of different companies or business units. Consider Value Inc.'s economic profit of \$50. Suppose Big Inc. had \$5,000 in invested capital but earned only a 15 percent return on capital (and assuming it doesn't have investment opportunities with higher ROIC). Its economic profit would be \$250. Wouldn't you rather create \$250 of economic profit rather than just \$50?

Finally, economic profit encourages a company to undertake investments that earn more than their cost of capital, even if their return is lower than the current average return. Suppose Value Inc. had the opportunity to invest an extra \$200 at a 15 percent return. Its average ROIC would decline from 20 percent to 18.6 percent, but its economic profit would increase from \$50 to \$60.

THE MATH OF VALUE CREATION

The chapters in Part Two provide a step-by-step guide for analyzing and valuing a company in practice, including how to measure and interpret the factors that affect value, ROIC, and revenue growth. As a bridge between the theoretical explanation of those factors provided earlier in this chapter and the practical guidance to come in Part Two, we introduce here the key value driver formula, a simple equation that captures the essence of valuation in practice.

The following is some terminology that we will use throughout the book (the terms are defined in detail in Part Two):

- *Net operating profit less adjusted taxes (NOPLAT)* represents the profits generated from the company's core operations after subtracting the income taxes related to the core operations.
- *Invested capital* represents the cumulative amount the business has invested in its core operations—primarily property, plant, and equipment and working capital.

[8]The present value of economic profit for a growing perpetuity is Economic Profit$_{\text{year 1}}$ divided by the cost of capital minus the growth rate. For Value Inc. the present value of economic profit = \$50/(10%–5%).

- *Net investment* is the increase in invested capital from one year to the next:

$$\text{Net Investment} = \text{Invested Capital}_{t+1} - \text{Invested Capital}_t$$

- *Free cash flow (FCF)* is the cash flow generated by the core operations of the business after deducting investments in new capital:

$$\text{FCF} = \text{NOPLAT} - \text{Net Investment}$$

- *Return on invested capital (ROIC)* is the return the company earns on each dollar invested in the business:

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Invested Capital}}$$

  (ROIC can be defined in two ways: as the return on all capital or as the return on new, or incremental, capital. For now, we assume that both returns are the same.)
- *Investment rate (IR)* is the portion of NOPLAT invested back into the business:

$$\text{IR} = \frac{\text{Net Investment}}{\text{NOPLAT}}$$

- *Weighted average cost of capital (WACC)* is the rate of return that investors expect to earn from investing in the company and therefore the appropriate discount rate for the free cash flow. WACC is defined in detail in Chapter 13.
- *Growth* (g) is the rate at which the company's NOPLAT and cash flow grow each year.

Assume that the company's revenues and NOPLAT grow at a constant rate and the company invests the same proportion of its NOPLAT in its business each year. Investing the same proportion of NOPLAT each year also means that the company's free cash flow will grow at a constant rate.

Since the company's cash flows are growing at a constant rate, we can begin by valuing a company using the well-known cash flow perpetuity formula:

$$\text{Value} = \frac{\text{FCF}_{t=1}}{\text{WACC} - g}$$

This formula is well established in the finance and mathematics literature.[9]

[9] For the derivation, see T. E. Copeland and J. Fred Weston, *Financial Theory and Corporate Policy*, 3rd ed. (Reading, MA: Addison-Wesley, 1988), Appendix A.

Next, define free cash flow in terms of NOPLAT and the investment rate:

$$\begin{aligned} \text{FCF} &= \text{NOPLAT} - \text{Net Investment} \\ &= \text{NOPLAT} - (\text{NOPLAT} \times \text{IR}) \\ &= \text{NOPLAT}(1 - \text{IR}) \end{aligned}$$

Earlier, we developed the relationship between the investment rate (IR), the company's projected growth in NOPLAT (g), and the return on investment (ROIC):[10]

$$g = \text{ROIC} \times \text{IR}$$

Solving for IR, rather than g, leads to:

$$\text{IR} = \frac{g}{\text{ROIC}}$$

Now build this into the definition of free cash flow:

$$\text{FCF} = \text{NOPLAT}\left(1 - \frac{g}{\text{ROIC}}\right)$$

Substituting for free cash flow in the cash flow perpetuity formula gives the key value driver formula:[11]

$$\text{Value} = \frac{\text{NOPLAT}_{t=1}\left(1 - \frac{g}{\text{ROIC}}\right)}{\text{WACC} - g}$$

This formula underpins the discounted-cash-flow (DCF) approach to valuation, and a variant of the equation lies behind the economic-profit approach. These two mathematically equivalent valuation techniques are described in detail in Chapter 8. You might go so far as to say that this formula represents all there is to valuation. Everything else is mere detail.

Substituting the forecast assumptions for Value Inc. and Volume Inc. in Exhibit 2.2 into the key value driver formula results in the same values we came up with when we discounted their cash flows:

[10]Technically, we should use the return on new, or incremental, capital, but for simplicity here, we assume that the ROIC and incremental ROIC are equal.

[11]Technically, this formula should use the return on new invested capital (RONIC), not the company's return on all invested capital (ROIC). For convenience throughout this book, we frequently use ROIC to denote both the return on all capital and the return on new invested capital.

Company	$\text{NOPLAT}_{t=1}$	Growth	ROIC	WACC	Value
Volume Inc.	\$100	5%	10%	10%	\$1,000
Value Inc.	\$100	5%	20%	10%	\$1,500

In most cases, we do not use this formula in practice. The reason is that in most situations, the model is overly restrictive, as it assumes a constant ROIC and growth rate going forward. For companies whose key value drivers are expected to change, we need a model that is more flexible in its forecasts. Nevertheless, while we do not use this formula in practice, it is extremely useful as a way to keep the mind focused on what drives value.

Until now, we have concentrated on how ROIC and growth drive the DCF valuation. It is also possible to use the key value driver formula to show that ROIC and growth determine multiples commonly used to analyze company valuation, such as price-to-earnings and market-to-book ratios. To see this, divide both sides of the key value driver formula by NOPLAT:

$$\frac{\text{Value}}{\text{NOPLAT}_{t=1}} = \frac{\left(1 - \frac{g}{\text{ROIC}}\right)}{\text{WACC} - g}$$

As the formula shows, a company's earnings multiple is driven by both its expected growth and its return on invested capital.

You can also turn the formula into a value-to-invested-capital formula. Start with the identity:

$$\text{NOPLAT} = \text{Invested Capital} \times \text{ROIC}$$

Substitute this definition of NOPLAT into the key value driver formula:

$$\text{Value} = \frac{\text{Invested Capital} \times \text{ROIC} \times \left(1 - \frac{g}{\text{ROIC}}\right)}{\text{WACC} - g}$$

Divide both sides by invested capital:[12]

$$\frac{\text{Value}}{\text{Invested Capital}} = \text{ROIC}\left(\frac{1 - \frac{g}{\text{ROIC}}}{\text{WACC} - g}\right)$$

[12]If total ROIC and incremental ROIC are not the same, then this equation becomes:

$$\frac{\text{Value}}{\text{Invested Capital}} = \text{ROIC}\left(\frac{1 - \frac{g}{\text{RONIC}}}{\text{WACC} - g}\right)$$

where ROIC equals the return on the company's current capital and RONIC equals the return on new invested capital.

Now that we have explained the logic behind the DCF approach to valuation, you may wonder why analysts' reports and investment-banking pitches so often use earnings multiples, rather than valuations based on DCF analysis. The answer is partly that earnings multiples are a useful shorthand for communicating values to a wider public. A leading sell-side analyst recently told us that he uses discounted cash flow to analyze and value companies but typically communicates his findings in terms of implied multiples. For example, an analyst might say Company X deserves a higher multiple than Company Y because it is expected to grow faster, earn higher margins, or generate more cash flow. Earnings multiples are also a useful sanity check for your valuation. In practice, we always compare a company's implied multiple based on our valuation with those of its peers to see if we can explain why its multiple is higher or lower in terms of its ROIC or growth rates. See Chapter 16 for a discussion of how to analyze earnings multiples.

SUMMARY

This chapter has shown that value is driven by expected cash flows discounted at a cost of capital. Cash flow, in turn, is driven by expected returns on invested capital and revenue growth. Companies create value only when ROIC exceeds their cost of capital. Further, higher-ROIC companies should typically prioritize growth over further improving ROIC, as growth is a more powerful value driver for them. In contrast, lower-ROIC companies should prioritize improving ROIC, as it is a stronger value driver.

3

Conservation of Value and the Role of Risk

In Chapter 2, we showed how cash flow drives value creation, and how growth and return on invested capital (ROIC) generate cash flow. Companies create value when they grow at returns on capital greater than their cost of capital or when they increase their returns on capital. The corollary, which we call the conservation of value, is that actions that don't increase cash flows over the long term will not create value, regardless of whether they improve earnings or otherwise make their financial statements look stronger. One exception could be actions that reduce a company's risk and, therefore, its cost of capital.[1] As risk is not well understood in corporate finance, this chapter also explores different types of risk and how they enter into a company's valuation.

CONSERVATION OF VALUE

A corollary of the principle that discounted cash flow (DCF) drives value is the conservation of value: anything that doesn't increase cash flows doesn't create value. So value is conserved, or unchanged, when a company changes the ownership of claims to its cash flows but doesn't change the total available cash flows—for example, when it substitutes debt for equity or issues debt to repurchase shares. Similarly, changing the appearance of the cash flows without actually changing the cash flows—say, by changing accounting techniques—doesn't change the value of a company.[2] While the validity of this principle is

[1] Technically, only risk reductions that reduce a company's nondiversifiable risk will reduce its cost of capital, as this chapter explains later.
[2] In some cases, a company can increase its value by reducing its cost of capital by using more debt in its capital structure. However, even in this case, the underlying change is to reduce taxes, but the overall pretax cost of capital doesn't change. See Chapter 29 for further discussion.

obvious, it is worth emphasizing, because executives, investors, and pundits so often forget it—for example, when they hope that one accounting treatment will lead to a higher value than another, or that some fancy financial structure will turn a mediocre deal into a winner.

The battle over how companies should account for executive stock options illustrates the extent to which executives continue to believe (wrongly) that the stock market is unaware of the conservation of value. Even though there is no cash effect when executive stock options are issued, they reduce the cash flow available to existing shareholders by diluting their ownership when the options are exercised. Under accounting rules dating back to the 1970s, companies could exclude the implicit cost of executive stock options from their income statements. In the early 1990s, as options became more material, the Financial Accounting Standards Board (FASB) proposed a change to the accounting rules, requiring companies to record an expense for the value of options when they are issued. A large group of executives and venture capitalists thought investors would be spooked if options were brought onto the income statement. Some claimed that the entire venture capital industry would be decimated because young start-up companies that provide much of their compensation through options would show low or negative profits.

The FASB issued its new rules in 2004,[3] more than a decade after taking up the issue and only after the bursting of the dot-com bubble. Despite dire predictions, the stock prices of companies didn't change when the new accounting rules were implemented, because the market already reflected the cost of the options in its valuations of companies.[4] One respected analyst told us, "I don't care whether they are recorded as an expense or simply disclosed in the footnotes. I know what to do with the information."

In this case, the conservation of value principle explains why executives didn't need to worry about any effects that changes in stock option accounting would have on their share price. The same applies to questions such as whether an acquisition creates value simply because reported earnings increase, whether a company should return cash to shareholders through share repurchases instead of dividends, or whether financial engineering creates value. In every circumstance, executives should focus on increasing cash flows rather than finding gimmicks that merely redistribute value among investors or make reported results look better. Executives should also be wary of proposals that claim to create value unless they're clear about how their actions will materially increase the size of the pie. If you can't pinpoint the tangible source

[3]Financial Accounting Standard 123R, released in December 2004, effective for periods beginning after June 15, 2005.

[4]D. Aboody, M. Barth, and R. Kasznik, "Firms' Voluntary Recognition of Stock-Based Compensation Expense," *Journal of Accounting Research* 42, no. 2 (December 2004): 251–275; D. Aboody, M. Barth, and R. Kasznik, "SFAS No. 123 Stock-Based Compensation Expense and Equity Market Values," *Accounting Review* 79, no. 2 (2004): 251–275; M. Semerdzhian, "The Effects of Expensing Stock Options and a New Approach to the Valuation Problem" (working paper, May 2004, SSRN).

of value creation, you're probably looking at an illusion, and you can be sure that's what the market will think, too.

Foundations of the Value Conservation Principle

The value conservation principle is described in the seminal textbook *Principles of Corporate Finance*, by Richard Brealey, Stewart Myers, and Franklin Allen.[5] One of the earliest applications of the principle can be found in the pioneering work of Nobel Prize winners Franco Modigliani and Merton Miller, financial economists who in the late 1950s and early 1960s questioned whether managers could use changes in capital structure to increase share prices. In 1958, they showed that the value of a company shouldn't be affected by changing the structure of the debt and equity ownership unless the overall cash flows generated by the company also change.[6]

Imagine a company that has no debt and generates $100 of cash flow each year before paying shareholders. Suppose the company is valued at $1,000. Now suppose the company borrows $200 and pays it out to the shareholders. Our knowledge of the core valuation principle and the value conservation principle tells us that the company would still be worth $1,000, with $200 for the creditors and $800 for the shareholders, because its cash flow available to pay the shareholders and creditors is still $100.

In most countries, however, borrowing money does change cash flows because interest payments are tax deductible. The total taxes paid by the company are lower, thereby increasing the cash flow available to pay both shareholders and creditors. In addition, having debt may induce managers to be more diligent (because they must have cash available to repay the debt on time) and, therefore, increase the company's cash flow. On the downside, having debt could make it more difficult for managers to raise capital for attractive investment opportunities, thereby reducing cash flow. The point is that what matters isn't the substitution of debt for equity in and of itself; it matters only if the substitution changes the company's cash flows through tax reductions or if associated changes in management decisions change cash flows.

In a related vein, finance academics in the 1960s developed the idea of efficient markets. While the meaning and validity of efficient markets are subjects of continuing debate, especially after the bursting of the dot-com and real estate bubbles, one implication of efficient-market theory remains: the stock market isn't easily fooled when companies undertake actions to increase reported accounting profit without increasing cash flows. One example is the market's reaction to changes in accounting for employee stock options, just described.

[5] R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 9th ed. (New York: McGraw-Hill/Irwin, 2007).
[6] F. Modigliani and M. H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, no. 3 (1958): 261–297.

And when the FASB eliminated goodwill amortization effective in 2002 and the International Accounting Standards Board (IASB) did the same in 2005, many companies reported increased profits, but their underlying values and stock prices didn't change, because the accounting change didn't affect cash flows. The evidence is overwhelming that the market isn't fooled by actions that don't affect cash flow, as we will show in Chapter 5.

Managerial Implications

The conservation of value principle is so useful because it tells us what to look for when analyzing whether some action will create value: the cash flow impact and nothing else. This principle applies across a wide range of important business decisions, such as accounting policy, acquisitions (Chapter 27), corporate portfolio decisions (Chapter 25), dividend payout policy (Chapter 29), and capital structure (also Chapter 29).

In this section, we provide three examples of useful applications for the conservation of value principle: share repurchases, acquisitions, and financial engineering.

Share repurchases Share repurchases have become a popular way for companies to return cash to investors (see Chapter 29 for more detail). Until the early 1980s, more than 90 percent of the total distributions by large U.S. companies to shareholders were dividends, and less than 10 percent were share repurchases; but since 1998, about 50 to 60 percent of total distributions have been share repurchases.[7]

To determine whether share repurchases create value, you must compare them with some other use of the cash. For example, assume that a company borrows \$100 to repurchase 10 percent of its shares. For every \$100 of shares repurchased, the company will pay, say, 6 percent interest on its new debt. After tax savings of 35 percent, its total earnings would decline by \$3.90. However, the number of shares has declined by 10 percent, so earnings per share (EPS) would increase by about 5 percent.

A 5 percent increase in EPS without working very hard sounds like a great deal. Assuming the company's price-to-earnings (P/E) ratio doesn't change, then its market value per share will also increase by 5 percent. In other words, you can get something for nothing: higher EPS with a constant P/E.

Unfortunately, this doesn't square with the conservation of value, because the total cash flow of the business has not increased. While EPS has increased by 5 percent, the company's debt has increased as well. With higher leverage, the company's equity cash flows will be more volatile, and investors will demand

[7]M. J. Mauboussin, "Clear Thinking about Share Repurchases," Legg Mason Capital Management, *Mauboussin on Strategy*, 2006.

a higher return. This will bring down the company's P/E, offsetting the increase in EPS.

However, even if cash flow isn't increased by a buyback, some have rightly argued that repurchasing shares can reduce the likelihood that management will invest the cash at low returns. If this is true and it is likely that management would otherwise have invested the money unwisely, then you have a legitimate source of value creation, because the operating cash flows of the company would increase. Said another way, when the likelihood of investing cash at low returns is high, share repurchases make sense as a tactic for avoiding value destruction. But they don't in themselves create value.

Some argue that management should repurchase shares when the company's shares are undervalued. Suppose management believes that the current share price of the company doesn't reflect its underlying potential, so it buys back shares today. One year later, the market price adjusts to reflect management's expectations. Has value been created? Once again, the answer is no, value has not been created; it has only been shifted from one set of shareholders (those who sold) to the shareholders who did not sell. So the holding shareholders may have benefited, but the shareholders as a whole were not affected. Buying back shares when they are undervalued may be good for the shareholders who don't sell, but studies of share repurchases have shown that companies aren't very good at timing share repurchases, often buying when their share prices are high, not low.[8]

Executives as a rule need to exercise caution when presented with transactions (like share repurchases) that appear to create value by boosting EPS. Always ask, "Where is the source of the value creation?" Some research and development (R&D)-intensive companies, for example, have searched for ways to capitalize R&D spending through complex joint ventures, hoping to lower R&D expenses that reduce EPS. But does the joint venture create value by increasing short-term EPS? No, and in fact it may destroy value because the company now transfers upside potential—and risk, of course—to its partners.

Acquisitions Chapter 27 covers acquisitions in more detail, but for now we can say that acquisitions create value only when the combined cash flows of the two companies increase due to cost reductions, accelerated revenue growth, or better use of fixed and working capital.

[8]B. Jiang and T. Koller, "The Savvy Executive's Guide to Buying Back Shares," *McKinsey on Finance*, no. 41 (Autumn 2011): 14–17. The results here are counter to academic studies that were based on earlier samples and included many small companies. Our study included only companies in the S&P 500. When share buybacks were rare, announcements were made with great fanfare and often provided strong signals of management's concern for capital discipline. Most of the fanfare has faded, as companies regularly repurchase shares, so announcements aren't a surprise to the market anymore.

When Johnson & Johnson (J&J) purchased Pfizer's consumer health business for $16 billion in late 2006, J&J immediately announced that the combination would reduce costs by $600 million per year. These savings were successfully realized and increased the combined operating profits of J&J/Pfizer's consumer businesses by 30 percent—equal to about $5 billion to $6 billion in present value. Taking these numbers, then, the cost savings of the merger alone would recoup one-third of the purchase price, making it a likely value creator.

A revenue acceleration example also comes from Johnson & Johnson, which acquired Neutrogena (a maker of skin care products) in 1994 for $924 million. Over the next eight years, management introduced 20 new products within existing product categories and launched an entire line of men's care products. It also accelerated the brand's presence outside the United States. As a result, J&J increased Neutrogena's sales from $281 million to $778 million by 2002.

The common element of both these acquisitions was radical performance improvement, not marginal change. But sometimes we have seen acquisitions justified by what could only be called magic.

Assume, for example, that Company A is worth $100 and Company B is worth $50, based on their respective expected cash flows. Company A buys Company B for $50, issuing its own shares. For simplicity, assume that the combined cash flows are not expected to increase. What is the new Company AB worth?

Immediately after the acquisition, the two companies are the same as they were before, with the same expected cash flows, and the original shareholders of the two companies still own the shares of the combined company. So Company AB should be worth $150, and the original A shareholders' shares of AB should be worth $100, while the original B shareholders' shares of AB should be worth $50.

As simple as this seems, some executives and financial professionals will still see some extra value in the transaction. Assume that Company A is expected to earn $5 next year, so its P/E is 20 times. Company B is expected to earn $3 next year, so its P/E is 16.7 times. What then will be the P/E of Company AB? A straightforward approach suggests that the value of Company AB should remain $150. Its earnings will be $8, so its P/E will be about 18.8, between A's and B's P/Es. But here's where the magic happens. Many executives and bankers believe that once A buys B, the stock market will apply A's P/E of 20 to B's earnings. In other words, B's earnings are worth more once they are owned by A. By this thinking, the value of Company AB would be $160, a $10 increase in the combined value.

There are even terms for this: *multiple expansion* in the United States and *rerating* in the United Kingdom. The notion is that the multiple of Company B's earnings expands to the level of Company A's because the market doesn't recognize that perhaps the new earnings added to A are not as valuable. This must be so, because B's earnings will now be all mixed up with A's, and the market won't be able to tell the difference.

Another version of the multiple-expansion illusion works the other way around, supposing Company B purchases Company A. We've heard the argument that since a company with a lower price-to-earnings (P/E) ratio is buying a higher-P/E company, it must be getting into higher-growth businesses. Higher growth is generally good, so another theory postulates that because B is accelerating its growth, its P/E will increase.

If multiple expansion were true, all acquisitions would create value because the P/E on the lower-P/E company's earnings would rise to that of the company with the higher P/E, regardless of which was the buyer or seller. But no data exist that support this fallacy. Multiple expansion may sound great, but it is an entirely unsound way of justifying an acquisition that doesn't have tangible benefits.

Every corporate leader must know this. So why are we discussing such obvious fallacies? The answer is that companies often do justify acquisitions using this flawed logic. Our alternative approach is simple: if you can't point to specific sources of increased cash flow, the stock market won't be fooled.

Financial engineering Another area where the value conservation principle is important is financial engineering, which unfortunately has no standard definition. For our purposes, we define financial engineering as the use of financial instruments or structures other than straight debt and equity to manage a company's capital structure and risk profile.

Financial engineering can include the use of derivatives, structured debt, securitization, and off-balance-sheet financing. While some of these activities can create real value, most don't. Even so, the motivation to engage in non-value-added financial engineering remains strong because of its short-term, illusory impact.

Consider that many of the largest hotel companies in the United States don't own most of the hotels they operate. Instead, the hotels themselves are owned by other companies, often structured as partnerships or real estate investment trusts (REITs). Unlike corporations, partnerships and REITs don't pay U.S. income taxes; taxes are paid only by their owners. Therefore, an entire layer of taxation is eliminated by placing hotels in partnerships and REITs in the United States. This method of separating ownership and operations lowers total income taxes paid to the government, so investors in the ownership and operating companies are better off as a group, because their aggregate cash flows are higher. This is an example of financial engineering that adds real value by increasing cash flows.

In contrast, sale-leaseback transactions rarely create value for investment-grade companies. In a sale-leaseback transaction, a company sells an asset that it owns but wants to continue to use (such as an office building) to a buyer who then leases it back to the company. Often, the company structures the lease so that it is treated as a sale for accounting purposes, and then removes the asset from the company's balance sheet. It can also use the sale proceeds to pay down debt. Now it appears that the company has fewer assets and less debt. Rental expense replaces future depreciation and interest expense (though rental expense is typically higher than the sum of depreciation and interest expense).

For larger investment-grade companies, the implied interest rate on the lease is often higher than the company's regular borrowing rate because the lessor uses the creditworthiness of the lessee to finance its purchase. In addition, the company buying the asset has to cover its cost of equity and its operating costs.

If the company intends to use the asset for its remaining life (by renewing the lease as it expires), then it has created no value, even though the company appears to be less capital-intensive and to have lower debt. In fact, it has destroyed value because the cost of the lease is higher than the cost of borrowing. The company also incurs its own transaction costs and may have to pay taxes on any gain from the sale of the asset. What's more, other creditors and rating agencies will often treat the lease as a debt equivalent anyway.

The transaction may create value if the company wants the ability to stop using the asset before its remaining life expires and wants to eliminate the risk that the value of the asset will be lower when it decides to stop using the asset.

Sale-leaseback transactions may also create value if the lessor is better able to use the tax benefits associated with owning the asset, such as accelerated depreciation. This does not violate the conservation of value principle, because the total cash flows to the companies involved have increased (at the expense of the government).

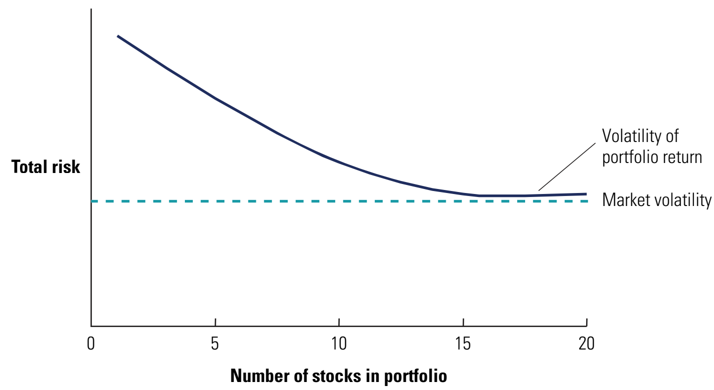
RISK AND VALUE CREATION

A company's future cash flows are unknown and therefore risky, so to complete our discussion of value creation, it is necessary to explain how risk affects value. Risk enters into valuation both through the company's cost of capital, which is the price of risk, and in the uncertainty surrounding future cash flows. Managers and investors need to pay particularly close attention to cash flow risks.

Price of Risk

The cost of capital is the price charged by investors for bearing the risk that the company's future cash flows may differ from what they anticipate when they make the investment. It is the opportunity cost versus what investors can earn from investing in something else with the same risk. The cost of capital is also called the discount rate, because you discount future cash flows at this

EXHIBIT 3.1 **Volatility of Portfolio Return: Declining with Diversification**



rate when calculating the present value of an investment, to reflect what you will have to pay investors.

The average cost of equity capital, or the price investors charged for their risk, in mid-2014 for a large nonfinancial company was about 9.5 percent, and most large companies' costs of equity capital fell in the range of 8 to 10 percent. That range can seem narrow, given that it encompasses companies with predictable cash flows, like Campbell Soup, and highly volatile companies like Google. The range is small because investors purposely avoid putting all their eggs in one basket.

Stock market investors, especially institutional investors, typically have hundreds of different stocks in their portfolios; even the most concentrated investors have at least 50. As a result, their exposure to any single company is limited. Exhibit 3.1 shows what happens to the total risk of a portfolio of stocks as more shares are added to the portfolio. The total risk declines because companies' cash flows are not correlated. Some will increase when others decline.

One of the key insights of academic finance that has stood the test of time concerns the effect of diversification on the cost of capital. If diversification reduces risk to investors and it is not costly to diversify, then investors will not demand a return for any risks they take that they can easily eliminate through diversification. They require compensation only for risks they cannot diversify away.

The risks they cannot diversify away are those that affect all companies—for example, exposure to economic cycles. However, since most of the risks that companies face are in fact diversifiable, most risks don't affect a company's cost of capital. One way to see this in practice is to note the fairly narrow range of P/Es for large companies. Most large companies have P/Es between 12 and 20. If the cost of capital varied from 6 to 15 percent instead of 8 to 10 percent, many more companies would have P/Es below 8 and above 25.

Whether a company's cost of capital is 8 percent or 10 percent or somewhere in between is a question of great dispute (the cost of capital is discussed in more detail in Chapter 13). For decades, the standard model for measuring differences in costs of capital has been the capital asset pricing model (CAPM). The CAPM has been challenged by academics and practitioners, but so far, no practical competing model has emerged.[9] Anyway, when returns on capital across companies vary from less than 5 percent to more than 30 percent (sometimes even within the same sector), a one-percentage-point difference in the cost of capital seems hardly worth arguing about. General risk affecting all companies may be priced into the cost of capital, but that does not mean executives do not need to worry about risk. The unique risks that any particular company faces of, say, running into business trouble or, even worse, bankruptcy (which clearly destroys shareholder value) are not priced into the cost of capital. Companies certainly do need to worry about the effects of such unique risk, as well as general risk on the total cash flows from any potential investment.

Level of Risk Exposure

The risk that companies must identify and manage is their total cash flow risk, meaning uncertainty about their future cash flows. Finance theory provides guidance on pricing the nondiversifiable part of that risk in the cost of capital. But it is, for the most part, silent about how much exposure to total cash flow risk (both unique/diversifiable and nondiversifiable) a company should take on. In practice, however, managers need to be aware that calculating expected cash flows can obscure material risks capable of jeopardizing their business when they are deciding how much cash flow risk to accept. They also need to manage any risks affecting cash flows that investors are unable to mitigate for themselves.

Deciding how much cash flow risk to take on What should companies look out for? Consider an example. Project A requires an up-front investment of \$2,000. If everything goes well with the project, the company earns \$1,000 per year forever. If not, the company gets zero. (Such all-or-nothing projects are not unusual.) To value project A, finance theory directs you to discount the expected cash flow at the cost of capital. But what is the expected cash flow in this case? If there is a 60 percent chance of everything going well, the expected

[9]Many in the academic community use the Fama-French three-factor model, but mostly for capital market research rather than business valuation. With this model, a stock's excess returns are regressed on excess market returns (similar to the CAPM), the excess returns of small stocks minus big stocks (SMB), and the excess returns of high book-to-market stocks minus low book-to-market stocks (HML). See E. Fama and K. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance* (June 1992): 427–465; E. Fama and K. French, "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33 (1993): 3–56.

cash flows would be $600 per year. At a 10 percent cost of capital, the project would be worth $6,000 once completed. Subtracting the $2,000 investment, the net value of the project before the investment is made is $4,000.

But the project will never generate $600 per year. It will generate annual cash flows of either $1,000 or zero. That means the present value of the discounted cash flows will be either $10,000 or nothing, making the project net of the initial investment worth either $8,000 or –$2,000. The probability of it being worth the expected value of $4,000 ($6,000 less the investment) is zero. Rather than knowing the expected value, managers would be better off knowing that the project carries a 60 percent chance of being worth $8,000 and a 40 percent risk of losing $2,000. Managers can then examine the scenarios under which each outcome prevails and decide whether the upside compensates for the downside, whether the company can comfortably absorb the potential loss, and whether they can take actions to reduce the magnitude or risk of loss. The theoretical approach of focusing on expected values, while mathematically correct, hides some important information about the range and exclusivity of particular outcomes.

Moreover, some companies don't apply the expected-value approach correctly. Few companies discuss multiple scenarios, preferring a single-point forecast on which to base a yes-or-no decision. So most companies would simply represent the expected cash flows from this project as being $1,000 per year, the amount if everything goes well, and allow for uncertainty in the cash flow by arbitrarily increasing the discount rate. While you can get to the right answer with this approach, it has two flaws. First, there is no easy way to determine the cost of capital that gives the correct value. In this case, using a 16.7 percent cost of capital instead of 10 percent results in a project value of $6,000 before the investment and $4,000 after the investment, but the only way to know that this was the correct value would be to conduct a thorough scenario analysis. Companies sometimes arbitrarily add a risk premium to the cost of capital, but there is no way for them to know whether the amount they add is even reasonably accurate. Second, the decision makers faced with a project with cash flows of $1,000 per year and a 16.7 percent cost of capital are still not thinking through the 40 percent risk that it might generate no cash at all.

How should a company think through whether to undertake the project with an upside of $8,000, a downside of –$2,000, and an expected value of $4,000? Theory says take on all projects with a positive expected value, regardless of the upside-versus-downside risk. A company is likely to have many small projects like the one mentioned, so for small projects, it can safely apply the theory of taking on all positive net present value (NPV) projects.

But what if instead the company has one large project where the downside possibility would bankrupt the company? Consider an electric power company with the opportunity to build a nuclear power facility for $15 billion (not unrealistic for a facility with two reactors). Suppose the company has $25 billion in existing debt and $25 billion in equity market capitalization. If the plant is successfully constructed and brought on line, it will be worth \$28 billion. But there is a 20 percent chance it will fail to receive regulatory approval and be worth zero. Looking at this scenario as a single project, the expected value is \$22 billion, or \$7 billion net of investment. Another way to put this is that there is an 80 percent chance the project will be worth \$13 billion (\$28 billion less \$15 billion investment) and a 20 percent chance it will be worth –\$15 billion. Furthermore, failure will bankrupt the company, because the cash flow from the company's existing plants will be insufficient to cover its existing debt plus the debt on the failed plant. In this case, the economics of the nuclear plant spill over onto the value of the rest of the company. Failure would wipe out all the equity of the company, not just the \$15 billion invested in the plant.

The theory can be extended to say that a company should not take on a risk that will put the rest of the company in danger. In other words, don't do anything that has large negative spillover effects on the rest of the company. This caveat would be enough to guide managers in the earlier example of deciding whether to go ahead with project A. If a \$2,000 loss would endanger the company as a whole, management should forgo the project, despite its 60 percent likelihood of success. But by the same token, companies should not try to reduce risks that don't threaten their ability to operate normally. For example, profitable companies with modest amounts of debt should not worry about interest rate risk, because it won't be large enough to threaten to disrupt the business.

Deciding which types of risk to hedge There are also risks that investors positively want companies to take. For example, investors in gold-mining companies and oil-production companies buy those stocks to gain exposure to often-volatile gold or oil prices. If gold and oil companies attempt to hedge their revenues, that effort merely complicates life for their investors, who then have to guess how much price risk is being hedged and how and whether management will change its policy in the future. Moreover, hedging may lock in today's prices for two years, the time horizon within which it is possible to hedge those commodities, but a company's present value includes the cash flows from subsequent years at fluctuating market prices. So while hedging may reduce the short-term cash flow volatility, it will have little effect on the company's valuation based on long-term cash flows.

Some risks, like the commodity price risk in this example of gold and oil companies, can be managed by shareholders themselves. Other, similar-looking risks—for example, some forms of currency risk—are harder for shareholders to manage. The general rule is to avoid hedging the first type of risk, but hedge the second if possible.

Consider the effect of currency risk on Heineken, the global brewer. Heineken produces its flagship brand, Heineken, in the Netherlands, and ships it around the world, especially to the United States. Most other large brewers, in contrast, produce most of their beer in the same national markets in which they sell it. So for most brewers, an exchange rate change affects only the translation of their profits into their reporting currency. For example, a 1 percent change in the value of the currency of one of their nonhome markets translates into a 1 percent change in revenues from those markets and a 1 percent change in profits as well. Note that the effect on revenues and profits is the same, because all the revenues and costs are in the same currency. There is no change in operating margin.

Heineken's picture is different. Consider its sales in the United States. When the exchange rate changes, Heineken's revenues in euros are affected, but not its costs. If the dollar declines by 1 percent, Heineken's euro revenues also decline by 1 percent. But since its costs are in euros, they don't change. Assuming a 10 percent margin to begin with, a 1 percent decline in the dollar will reduce Heineken's margin to 9 percent, and its profits reported in euros will decline by a whopping 10 percent.

Because Heineken's production facilities are in a different country and it is unable to pass on cost increases because it is competing with locally produced products, its foreign-exchange risk is much larger than that of other global brewers. Hedging might be much more important for Heineken than for other global brewers, because the impact of exchange-rate changes on its business is much greater.

SUMMARY

A corollary of the principle that discounted cash flow drives value is the conservation of value: anything that doesn't increase cash flows doesn't create value. So value is conserved, or unchanged, when a company changes the ownership of claims to its cash flows but doesn't change the total available cash flows. Similarly, changing the appearance of the cash flows without actually changing the cash flows—say, by changing accounting techniques—doesn't change the company's value.

Risk enters into valuation both through the company's cost of capital, which is the price investors charge for bearing risk, and in the uncertainty surrounding future cash flows. Because investors can diversify their portfolios, the only risk that is captured in the cost of capital is the risk that cannot be diversified. Although finance theory has little to say on how to approach cash flow risk, in practice managers' and investors' valuations also need to take account of any risks attached to cash flows that shareholders cannot manage for themselves.

4

The Alchemy of Stock Market Performance

To measure how a company and its management perform, analysts and investors frequently use total returns to shareholders (TRS). This measure combines the amount shareholders gain through any increase in the share price over a given period with the sum of dividends paid to them over the period.[1] That sounds like a good idea: if managers focus on improving TRS to win performance bonuses, then their interests and the interests of their shareholders should be aligned. The evidence shows that this is indeed true over long periods—at a minimum, 10 to 15 years. But TRS measured over periods shorter than 10 years may not reflect the actual performance of a company and its management for two main reasons.

First, improving TRS is much harder for managers leading an already-successful company than for those leading a company with substantial room for improvement. The reason is that a company's progress toward performance leadership in any market will attract investors expecting more of the same, pushing up the share price. Managers then have to pull off herculean feats of real performance improvement to exceed those expectations and continue to outperform on TRS. We call their predicament the "expectations treadmill." Clearly, managers' capacity to influence TRS depends heavily on their business's position in the cycle of shareholder expectations, from start-up to maturity. But this position is beyond their control, making TRS in isolation an unfair measure of their performance.

Second, when TRS is analyzed in the traditional way, it doesn't show the extent to which improvements in operating performance contribute to TRS as a whole. However, improved operations constitute the only part of the measure

[1]Later in this chapter, we'll show that we also need to consider the impact of share repurchases as a significant source of cash distributions.

that reflects sustainable, long-term value creation and is also within management control.

The widespread use of traditional TRS as a measure of management performance therefore creates perverse incentives. Managers running full tilt on the expectations treadmill may be tempted to pursue ideas that give an immediate bump to their TRS. But they will likely realize such ideas at the expense of more solid investments that would yield greater value for shareholders over the long term, despite a short-term hit to TRS. In addition, TRS may rise or fall across the board for all companies because of external factors beyond managers' control, such as changing interest rates. Strictly speaking, such factors should play no part in managers' compensation.

This chapter starts by explaining the expectations treadmill and examining the mechanics of TRS, linking them to the core principles of value creation. It then recommends a more fundamental and fine-grained approach to analyzing TRS that isolates how much TRS came from revenue growth and improvements in return on invested capital (ROIC)—the factors that drive long-term value creation. Managers, boards of directors, and investors can learn much more about company performance from this granular breakdown of TRS. The chapter underlines the importance to investors and managers of understanding the expectations treadmill so they can continue to support investments that will create value for shareholders in the long term, despite their possible negative effects on TRS in the short run.

WHY SHAREHOLDER EXPECTATIONS BECOME A TREADMILL

The return on capital that a company earns is not the same as the return earned by every shareholder. Suppose a company can invest $1,000 in a factory and earn $200 a year, which it pays out in dividends to its shareholders. The first investors in the company pay $1,000 in total for their shares, and if they hold the shares, they will earn 20 percent per year ($200 divided by $1,000).

Suppose that after one year, all the investors decide to sell their shares, and they find buyers who pay $2,000 for the lot. The buyers will earn only 10 percent per year on their investment ($200 divided by $2,000). The first investors will earn a 120 percent return ($200 dividends plus $1,000 gain on their shares versus their initial investment of $1,000). So the company's return on capital is 20 percent, while one group of investors earns 120 percent, and the other group earns 10 percent. All the investors collectively will earn, on a time-weighted average, the same return as the company. But individual groups of investors will earn very different returns, because they pay different prices for the shares, based on their expectations of future performance.

One way of understanding the effects of this dynamic is through the analogy of a treadmill, the speed of which represents the expectations built into a company's share price. If the company beats expectations, and if the market believes the improvement is sustainable, the company's stock price goes up, in essence capitalizing the future value of this incremental improvement. This improves TRS. But it also means that managers have to run even faster just to maintain the new stock price, let alone improve it further: the speed of the treadmill quickens as performance improves. So a company with low expectations of success among shareholders at the beginning of a period may have an easier time outperforming the stock market simply because low expectations are easier to beat.

The treadmill analogy is useful because it describes the difficulty of continuing to outperform the stock market. At some point, it becomes impossible for management to deliver on accelerating expectations without faltering, just as anyone would eventually stumble on a treadmill that kept moving faster.

Consider the case of Theresa Turnaround, a fictional character based on the experience of many CEOs. Theresa has just been hired as the CEO of Prospectus, a company with below-average returns on capital and growth relative to competitors. Because of this past performance, the market doesn't expect much, so the value of Prospectus is low relative to competitors. Theresa hires a top-notch team and gets to work. After two years, Prospectus is gaining ground on its peers in margins and return on capital, and market share is rising. Prospectus's stock price rises twice as fast as its peers' because the market wasn't expecting the company's turnaround.

Theresa and her team continue their hard work. After two more years, Prospectus has become the industry leader in operating performance, with the highest return on capital. Because of its low starting point, the company's share price has risen at four times the rate of the industry average. Given Prospectus's new trajectory and consistent performance, the market expects continued above-average returns on capital and revenue growth.

As time goes by, Prospectus maintains its high return on capital and leading market share. But two years later, Theresa notes with frustration that her company's shares are now doing no better than those of its peers, even though the company has outperformed rivals. At this point, Theresa is trapped on the expectations treadmill: she and her team have done such a good job that the expectation of continued high performance is already incorporated into the company's share price. As long as her company delivers results in line with the market's expectations, its share price performance will be no better or worse than average.[2]

This explains why extraordinary managers may deliver only ordinary TRS: even for the extraordinary manager, it can be extremely difficult to keep beating high expectations. It also explains why managers of companies with low performance expectations might easily earn a high TRS, at least for a short time.

[2]Theoretically, if a company's performance exactly matches expectations, its TRS will equal the cost of equity. In practice, however, with continual changes in interest rates, inflation, and economic activity, comparison to the broader market is sometimes preferable.

They can create a higher TRS by delivering performance that raises shareholder expectations to the level of that of their peers in the sector.

The danger for companies whose shareholders already have high expectations is that in their quest to achieve above-peer TRS, they may resort to misguided actions, such as pushing for unrealistic earnings growth or pursuing big, risky acquisitions. Consider the electric power boom at the end of the 1990s and in the early 2000s. Deregulation led to high hopes for power-generation companies, so deregulated energy producers were spun off from their regulated parents at extremely high valuations. Mirant, for instance, was spun off from Southern Company in October 2000 with a combined equity and debt capitalization of almost $18 billion, a multiple of about 30 times earnings before interest, taxes, and amortization (EBITA)—quite extraordinary for a power-generation company. To justify its value, Mirant expanded aggressively, as did similar companies, investing in power plants in the Bahamas, Brazil, Chile, the United Kingdom, Germany, China, and the Philippines, as well as 14 U.S. states. The debt burden from these investments quickly became too much for Mirant to handle, and the company filed for bankruptcy in July 2003. The expectations treadmill pushed Mirant into taking enormous risks to justify its share price, and it paid the ultimate price.

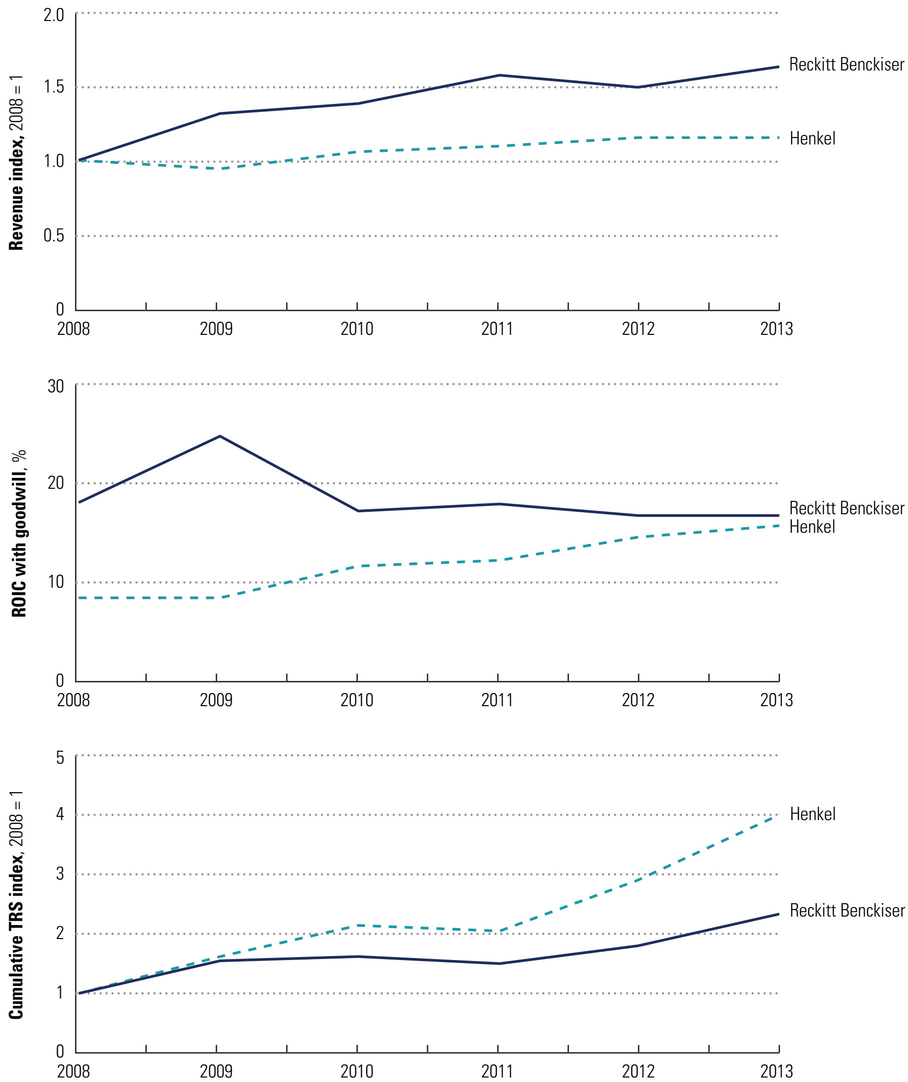
The expectations treadmill is the dynamic behind the adage that a good company and a good investment may not be the same. In the short term, good companies may not be good investments, because future great performance might already be built into the share price. Smart investors often prefer weaker-performing companies, because they have more upside potential, as the expectations expressed in their lower share prices are easier to beat.

REAL-WORLD EFFECTS OF THE EXPECTATIONS TREADMILL

Henkel and Reckitt Benckiser Group (RB) are two of the largest global consumer goods companies, with 2013 revenues of €16 billion and €12 billion, respectively. Henkel is known for brands such as Persil, Schwarzkopf, Purex, Dial, and Loctite, while RB is known for Lysol, Durex, Vanish, Musinex, and Woolite. From 2008 through 2013, RB outperformed Henkel on the key value drivers, growth and ROIC, but Henkel's shareholders earned higher returns. Exhibit 4.1 shows the revenue growth and ROIC for RB and Henkel, as well as total returns to shareholders (stock price appreciation plus dividends). RB's revenues grew 10 percent per year, compared with Henkel's 3 percent, and RB also earned a higher ROIC throughout the period. Yet RB investors earned an annualized return to shareholders of 19 percent per year, compared with Henkel's higher return of 32 percent per year.

The expectations treadmill explains the mismatch between TRS and the underlying value created by the two companies. Using the ratio of enterprise value (EV) to net operating profit less adjusted taxes (NOPLAT) as a proxy for

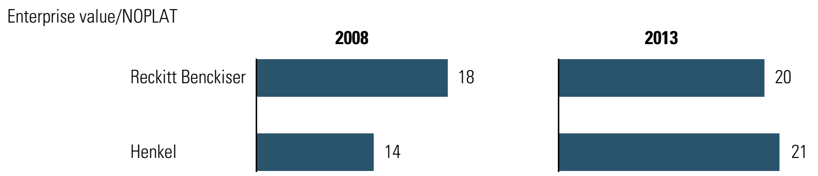
EXHIBIT 4.1 **Reckitt Benckiser vs. Henkel: Growth, ROIC, and TRS Performance**



market expectations, RB's EV/NOPLAT was relatively flat, moving from 18 times to 20 times. Henkel, in contrast, moved from only 14 times to 21 times (see Exhibit 4.2). Henkel's low starting multiple in 2008 reflected difficulties with its adhesives business, which experienced significant declines in sales volume in 2008 and 2009.

Which company did a better job? You can make arguments for either one: Henkel succeeded in outperforming its expectations, and RB succeeded in delivering against high expectations. TRS might have been a fair measure of

EXHIBIT 4.2 **Reckitt Benckiser vs. Henkel: Multiple Increase Helps Henkel's TRS**



the performance of Henkel's managers, but it would not have reflected what a great job the RB team did. For TRS to provide deeper insight into a company's true performance, we need a finer-grained look inside this measure.

DECOMPOSING TRS

Decomposing TRS and quantifying its components in the manner outlined in this section serves two purposes. First, when managers, boards of directors, and investors understand the sources of TRS, they are better able to evaluate management. For example, it's important to know that RB's TRS, though lower than Henkel's, reflected strong underlying performance against high expectations. Second, decomposing TRS can help with setting future targets. For example, Henkel's managers are unlikely to repeat their high TRS, because that would probably require raising the company's earnings multiple far above the multiples of RB and other strong consumer goods players, an impossible feat.

The traditional approach to analyzing TRS treats the key components as if they were independent of each other. But while this approach is mathematically correct, it does not link TRS to the true underlying sources of value creation. The decomposition we recommend gives managers a clearer understanding of the elements of TRS they can change, those that are beyond their control, and the speed at which their particular expectations treadmill is running. This information helps managers to focus on creating lasting value and communicate to investors and other stakeholders how their plans are likely to affect TRS in the short and long terms.

The traditional approach begins with the definition of TRS as the percent change in share price plus the dividend yield:

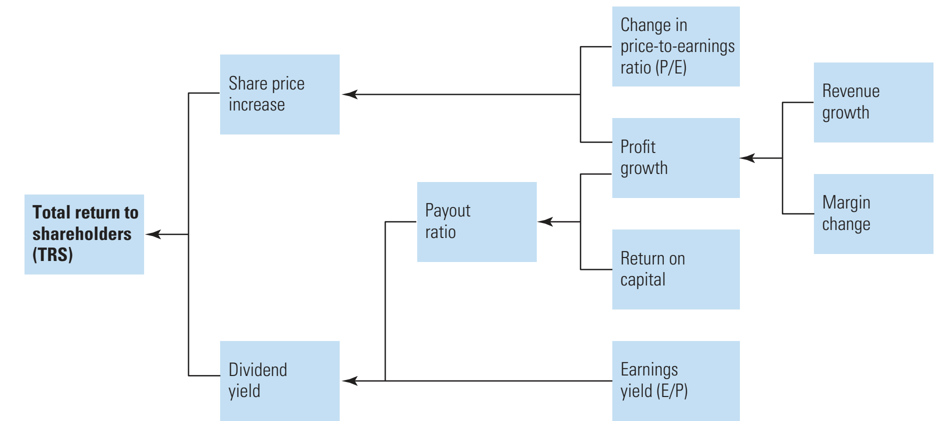
$$\text{TRS} = \text{Percent Change in Share Price} + \text{Dividend Yield}$$

The change in share price can be expressed as a function of the change in earnings and the change in a company's price-to-earnings (P/E) ratio:[3]

$$\text{TRS} = \text{Percent Increase in Earnings} + \text{Percent Change in P/E} + \text{Dividend Yield}$$

[3]Technically, there is an additional cross-term, which reflects the interaction of the share price change and the P/E change, but it is generally small, so we ignore it here.

EXHIBIT 4.3 **Economic Variables That Explain Long-Term TRS**



There are a few problems with expressing TRS this way. One is that a manager might assume that all forms of earnings growth create an equal amount of value. Yet we know from Chapter 2 that different sources of earnings growth may create different amounts of value, because they are associated with different returns on capital and therefore generate different cash flows. For example, growth from acquisitions may reduce future dividends because of the large investments required to acquire assets.

A second problem is that this approach suggests the dividend yield can be increased without affecting future earnings, as if dividends themselves create value. But dividends are merely a residual. For example, if a company pays a higher dividend today by taking on more debt, that simply means future dividends must be lower because future interest expense and debt repayments will be higher. Similarly, if a company manages to pay a higher dividend by forgoing attractive investment opportunities, then future dividends will suffer as future cash flows from operations will be lower.

Finally, the traditional expression of TRS fails to account for the impact of financial leverage: two companies that create underlying value equally well could generate very different TRS, simply because of the differences in their debt-to-equity ratios and the resulting differences in their risks, which we discuss further later in this section.

Instead, we can decompose the traditional TRS components into ones that are more insightful for understanding a company's TRS. Exhibit 4.3 shows this graphically.

The derivation works as follows, assuming a company with no debt that pays out all its cash flow as dividends. Start with the traditional definition:

$$\text{TRS} = \text{Percent Increase in Earnings} + \text{Percent Change in P/E} + \text{Dividend Yield}$$

The percent increase in earnings can be decomposed into the increase in revenues and the change in profit margin:[4]

$$\begin{aligned}\text{Percent Increase in Earnings} &= \text{Percent Increase in Revenues}\\ &\quad + \text{Percent Increase in Profit Margin}\end{aligned}$$

The dividend yield can be decomposed into a company's growth rate, return on capital, and P/E:

$$\text{Dividend Yield} = \frac{\text{Dividends}}{\text{Share Price}}$$

From Chapter 2, we know that cash flow and therefore dividends are driven by growth and ROIC:

$$\text{Dividend} = \text{Cash Flow} = \text{Earnings}\left(1 - \frac{g}{\text{ROIC}}\right)$$

And the share price is the earnings times the P/E:

$$\text{Share Price} = \text{Earnings}\,(P/E)$$

So the dividend yield can be expressed as follows:

$$\text{Dividend Yield} = \frac{\text{Earnings}\left(1 - \frac{g}{\text{ROIC}}\right)}{\text{Earnings}\,(P/E)}$$

The earnings in the numerator and denominator cancel out, leaving the following:

$$\text{Dividend Yield} = \frac{1 - \frac{g}{\text{ROIC}}}{P/E}$$

which can be further expressed as:

$$\text{Dividend Yield} = \left(1 - \frac{g}{\text{ROIC}}\right)\frac{E}{P} = \frac{E}{P} - \frac{g}{\text{ROIC}}\left(\frac{E}{P}\right)$$

where E/P is the inverse of the price-to-earnings ratio, or earnings yield. It represents the return an investor would earn if the company did not grow or

[4]To be precise, there is an additional cross-term that reflects the interaction of these two effects, which we have omitted to focus on the key points.

improve its profit margin and it paid out all its earnings in dividends (its share price would remain constant). The second term represents the part of its earnings yield that the company must reinvest each year to achieve its growth at its level of ROIC.

This leads to the following equation for TRS:

$$\begin{aligned}\text{TRS} &= \text{Percent Increase in Revenue} + \text{Impact of Change in Profit Margin}\\ &\quad + \text{Percent Change in } P/E + E/P - \frac{g}{\text{ROIC}}(E/P)\end{aligned}$$

The TRS equation can be rearranged as follows:

$$\begin{aligned}\text{TRS} &= \text{Percent Increase in Revenue} - \left(\frac{g}{\text{ROIC}}\right)\left(\frac{E}{P}\right)\\ &\quad + \text{Impact of Change in Profit Margin}\\ &\quad + \frac{E}{P}\\ &\quad + \text{Percent Change in } \frac{P}{E}\end{aligned}$$

This decomposition leads to four key drivers of TRS, one for each of the lines in the equation:

1. The value generated from revenue growth net of the capital required to grow at the company's projected ROIC
2. The impact of profit margin improvements
3. What TRS would have been without any growth and profit margin improvements (*E/P*), often called the earnings yield or zero growth return
4. Changes in shareholders' expectations about the company's performance, measured by the change in its P/E or other earnings multiple

We can add additional complications, such as the impact of debt, share repurchases, and one-off items.

Exhibit 4.4 uses the financials of a hypothetical company to compare the two TRS decomposition approaches.[5] First, using a traditional approach, Company A has a 14.4 percent TRS, based on 7 percent earnings growth, a 3 percent change in the company's P/E (as a proxy for changed expectations), and a 4.4 percent dividend yield. Then, in the column to the right of the traditional approach, we break down the TRS of Company A into three

[5]The example assumes no changes in profit margins for both companies so that earnings growth can arise only from investments.

EXHIBIT 4.4 **Traditional vs. Enhanced TRS Decomposition**

Company A financials		
$ million	**Base year**	**1 year later**
Invested capital	100.0	107.0
Earnings	12.5	13.4
P/E (multiple)	10.0	10.3
Equity value	125.0	137.5
Dividends	5.0	5.5
TRS, %		14.4

Decomposition of TRS		
%	**Traditional**	**Enhanced**
Growth	7.0	7.0
Required investment	–	(5.6)
TRS from performance	7.0	1.4
Earnings yield	–	10.0
Change in P/E	3.0	3.0
Dividend yield	4.4	–
TRS, %	14.4	14.4

of the four parts just outlined (for simplicity, in this example, Company A does not increase its margins). This enhanced approach shows that not much of the 14.4 percent TRS reflects the creation of new value. First, the reinvestment required to achieve 7 percent growth in earnings consumed most of the earnings growth itself, leaving TRS arising from performance at only 1.4 percent. Another 3 percent of TRS comes from a change in shareholder expectations (reflected in the P/E multiple increase), rather than performance, and the remaining 10 percent is simply the earnings yield, reflecting what the TRS would have been with zero growth and if investors had not changed their expectations.

We have found that many people struggle with the earnings yield (zero-growth return) part of this decomposition. Here's a simple example of how this works. Suppose you have two companies, H and L, each with $100 of earnings and zero growth. Since the companies aren't growing, they don't need to invest, so dividends to shareholders would equal earnings. Company H has a P/E of 20, and Company L has a P/E of 15. Exhibit 4.5 shows why the inverse of the P/E, the earnings yield, is the return the companies would earn if they didn't grow and their P/Es didn't change.

EXHIBIT 4.5 **Earnings Yield: TRS with Zero Growth**

	Company H		**Company L**	
	Year 0	**Year 1**	**Year 0**	**Year 1**
Earnings, $	100	100	100	100
P/E	20	20	15	15
Value, $	2,000	2,000	1,500	1,500
Dividends (equals earnings), $		100		100
Value plus dividends, $		2,100		1,600
TRS, %		5.0		6.7
Inverse of P/E, %		5.0		6.7

EXHIBIT 4.6 **Enhancing TRS Decomposition to Uncover Effect of Leverage**

Company B financials

$ million	**Base year**	**1 year later**
Enterprise value	125.0	137.5
Debt[1]	(25.0)	(25.0)
Equity value	100.0	112.5
Dividends		5.5
P/E (multiple)	8.0	8.4
TRS, %		18.0

Decomposition of TRS

%	**Traditional**	**Enhanced**
Growth	7.0	7.0
Required investment	–	(5.6)
TRS from performance	7.0	1.4
Earnings yield	–	10.0
Change in P/E[2]	5.5	3.0
Impact of financial leverage	–	3.6
Dividend yield	5.5	–
TRS, %	18.0	18.0

[1] Assumes, for illustrative purposes, that debt carries no interest.
[2] Change in P/E multiple for traditional approach vs. change in unlevered P/E multiple in enhanced approach (enterprise value/earnings).

In the example, you can see that the TRS of Company H is 5.0 percent, exactly equal to the inverse of the P/E, the earnings yield. Similarly, Company L's TRS of 6.7 percent equals the inverse of its P/E. Note also that Company H, with the higher P/E, has the lower earnings yield (or zero-growth TRS). This demonstrates that companies with higher P/Es have to achieve greater growth or improvements in ROIC to outperform the TRS of companies with lower P/Es.

The next example shows the impact of debt financing on the TRS decomposition. Suppose you own a house worth $500,000 and you've borrowed $200,000 against the house. If the house increases in value to $550,000, your equity value would increase from $300,000 to $350,000. A 10 percent increase in the value of the house leads to a 17 percent return on your equity.

The same concept applies to companies. Consider Company B, which is identical to Company A except for its debt financing. As detailed in Exhibit 4.6, the difference in financing means Company B generated a higher TRS of 18 percent. The traditional approach to decomposing TRS suggests that Company B's shareholders benefited from a higher dividend yield and a stronger increase in expectations. However, our more fundamental decomposition of Company B, based on earnings yield (zero-growth TRS) and changed expectations measured by the unlevered P/E (ratio of enterprise value to earnings), shows that the first three parts of the company's decomposed TRS are in fact identical to those of Company A. The additional 3.6 percent TRS for Company B arises from the higher proportion of debt in its capital, rather than any newly created value. Adjusting for the higher financial risk associated with higher debt shows that Company B did not in fact create more value than Company A—an important fact for investors and the companies' executives.

Exhibit 4.7 returns to the comparison of RB and Henkel, showing the TRS decomposition for the two companies. While Henkel's 32 percent annual TRS was higher than RB's 19 percent, RB outperformed Henkel on the fraction of

EXHIBIT 4.7 **Reckitt Benckiser vs. Henkel: TRS Decomposition, 2008–2013**

% annualized

	Henkel	Reckitt Benckiser	Difference
Revenue growth	3	10	(7)
Investment for growth	2	(4)	6
Net impact of growth	5	6	(1)
Change in margin	8	3	5
TRS from performance	13	9	4
Earnings yield (zero-growth return)	7	7	–
Change in earnings multiple	8	2	6
Impact of financial leverage	7	1	6
Nonoperating items	(3)	–	(3)
	32	19	13

TRS derived from growth, with growth, net of investments, contributing 6 percent to TRS, versus 5 percent for Henkel.[6]

Henkel benefited from a much larger increase in operating profit margin (a TRS effect of 8 percent versus 3 percent) by increasing its margin from 11 percent to 16 percent, while RB increased from 23 percent to 26 percent. Note that even though Henkel's margin increased more, RB still earned a much higher margin (and ROIC).

Henkel also outperformed RB on increasing expectations and financial leverage. Henkel's EV/NOPLAT multiple increased from 14 times to 21 times, while RB increased from 18 times to 20 times. Note that both ended up at similar multiples, though Henkel had the advantage of starting from a lower level.

Henkel had a further six-percentage-point advantage in TRS due to higher financial leverage. Henkel started the period with a debt to enterprise value of 33 percent, while RB started at only 6 percent. Note that by the end of the period, Henkel had reduced its leverage to a very low level, similar to RB's.

Leverage has a multiplier effect on TRS relative to underlying economic performance. In other words, because of Henkel's higher leverage, a 1 percent increase in revenues has a greater impact on Henkel's share price than the same increase for RB has on its share price. As we discuss in Chapter 29, however, greater leverage doesn't necessarily create value, because greater leverage equals greater risk, and greater risk can amplify weaker as well as stronger performance.

The decomposition of shareholder returns can also show what options a company has for achieving higher levels of TRS in the future. For example, at the time of writing, RB and Henkel had similar expectations built into their share prices (based on similar multiples), and those expectations were above average for companies sharing their performance characteristics. Therefore,

[6]Note that Henkel's investment for growth adds to, rather than subtracts from, the TRS from growth in Exhibit 4.7. This is because Henkel improved capital productivity and shrank their invested capital.

the opportunity to improve future TRS by continuing to increase expectations had already passed for Henkel, as had the higher-leverage option, since its capital structure had become similar to RB's. From this, we can conclude that the TRS differentiators for the two companies over the next several years will mostly be underlying growth and returns on capital.

UNDERSTANDING EXPECTATIONS

As the examples in this chapter have shown, investors' expectations at the beginning and end of the measurement period have a big effect on TRS. A crucial issue for investors and executives to understand, however, is that a company whose TRS has consistently outperformed the market will reach a point where it will no longer be able to satisfy expectations reflected in its share price. From that point, TRS will be lower than it was in the past, even though the company may still be creating huge amounts of value. Managers need to realize and communicate to their boards and to investors that a small decline in TRS is better for shareholders in the long run at this juncture than a desperate attempt to maintain TRS through ill-advised acquisitions or new ventures.

This was arguably the point that Home Depot had reached in 1999. Earlier, we used earnings multiples to express expectations, but you can also translate those multiples into the revenue growth rate and ROIC required to satisfy current shareholder expectations by reverse engineering the share price. Such an exercise can also help managers assess their performance plans and spot any gaps between their likely outcome and the market's expectations. At the end of 1999, Home Depot had a market value of $132 billion, with an earnings multiple of 47. Using a discounted cash flow model that assumes constant margins and return on capital, Home Depot would have had to increase revenues by 26 percent per year over the next 15 years to maintain its 1999 share price. Home Depot's actual revenue growth through 2006 averaged a very healthy 13 percent per year, an impressive number for such a large company but far below the growth required to justify its share price in 1999. It's no surprise, therefore, that Home Depot's shares underperformed the S&P 500 by 8 percent per year over the period. Since then, Home Depot's revenues actually declined due to weakness in the housing market, from $90 billion in 2006 to $78 billion in 2013.

What should Home Depot's board of directors have done, given its high market value in 1999? Celebrating is definitely not the answer. Some companies would try to justify their high share prices by considering all sorts of risky strategies. But given Home Depot's size, the chances of finding enough high-ROIC growth opportunities to justify its 1999 share price were virtually nil.

Realistically, there wasn't much Home Depot could have done except prepare for an inevitable sharp decline in share price: Home Depot's market value dropped from $130 billion in December 1999 to $80 billion in December 2006 (it increased to $110 billion by mid-2014). Some companies can take advantage of their high share prices to make acquisitions. But that probably wasn't a good idea for Home Depot because of its high growth—a large-enough management challenge to maintain, even without considering that the retail industry doesn't have a track record of making large acquisitions successfully.

Home Depot's situation in 1999 was unusual. Most companies, most of the time, will not have much trouble satisfying the shareholder expectations expressed in their current share price simply by performing as well as the rest of their industry. We have reverse engineered hundreds of companies' share prices over the years using discounted cash flows. With the exception of the Internet bubble era (1999–2000), at least 80 percent of the companies have had performance expectations built into their share prices that are in line with industry growth expectations and returns on capital. TRS for a company among these 80 percent is unlikely to be much different from the industry average unless the company performs significantly better or worse than expected, relative to its industry peers. The other 20 percent, however, should brace themselves for a significantly faster or slower ride on the treadmill. Managers who reverse engineer their share prices to understand expectations of their ROIC and growth can benefit from seeing on which side of this 80/20 divide they fall.

MANAGERIAL IMPLICATIONS

The expectations treadmill makes it difficult to use TRS as a performance measurement tool. As we saw in the example of RB and Henkel, the sizable differences in TRS for the two companies from 2008 to 2013 masked the big difference in expectations at the beginning of the measurement period. In Home Depot's case, living up to the expectations was virtually impossible, as no company can run that fast for very long.

As a result of the expectations treadmill, many executive compensation systems tied to TRS do not reward managers for their performance as managers, since the majority of a company's short-term TRS is driven by movements in its industry and the broader market. That was the case for the many executives who became wealthy from stock options in the 1980s and 1990s, a time when share prices increased primarily because of falling interest rates, rather than anything those managers did. Conversely, many stock option gains were wiped out during the 2008 financial crisis. Again, the causes of these gains and losses were largely disconnected from anything managers did or didn't do (with the exception of managers in financial institutions).

Instead of focusing primarily on a company's TRS over a given period, effective compensation systems should focus on growth, ROIC, and TRS performance relative to peers. That would eliminate much of the TRS that is not driven by company-specific performance. Why hasn't such a simple solution been adopted by companies? Mostly thanks to the influence of U.S. accounting rules. Until 2004, stock options weren't reported as an expense on the income statement as long as they met certain criteria, one of which was that the exercise price had to be fixed. Any approach based on relative performance would have shown up as an expense in a company's income statement, so naturally companies adopted fixed-price options that led to higher accounting income.

In addition to fixing compensation systems, executives need to become much more sophisticated in their interpretation of TRS, especially short-term TRS. If executives and boards understand what expectations are built into their own and their peers' share prices, they can better anticipate how their actions might affect their own share prices when the market finds out about them. For example, if you're executing a great strategy that will create significant value but the market already expects you to succeed, you can't expect to outperform on TRS. The management team and board need to know this, so the board will take a long-term view and continue to support management's value-creating priorities, even if these do not immediately strengthen the share price.

Executives also need to give up the bad habit of incessantly monitoring their stock prices. TRS is largely meaningless over short periods. In a typical three-month time frame, more than 40 percent of companies experience a share price increase or decrease of over 10 percent,[7] movements that are nothing more than random. Therefore, executives shouldn't even try to understand daily share price changes unless prices move over 2 percent more than the peer average in a single day or 10 percent more in a quarter.

Finally, be careful what you wish for. All executives and investors like to see their company's share price increase. But once your share price rises, it's hard to keep it rising faster than the market average. The expectations treadmill is virtually impossible to escape, and we don't know any easy way to manage expectations down.

[7]Share price movement relative to the S&P 500 index for a sample of nonfinancial companies with greater than $1 billion market capitalization, measured during 2004–2007.

5

The Stock Market Is Smarter Than You Think

The stock market's volatility and the erratic pricing of some companies' shares have raised questions about whether stock prices are actually linked to economic fundamentals. Some experts even assert that stock markets lead lives of their own. Nobel Prize winner Robert Shiller writes, "Fundamentally, stock markets are driven by popular narratives, which don't need basis in solid facts."[1] Bill Gross, cofounder and former chief investment officer of PIMCO, one of the world's largest fixed-income investment managers, claims that the last 100 years of U.S. stock returns "belied a commonsensical flaw much like that of a chain letter or yes—a Ponzi scheme."[2]

Does it make sense to view the stock market as an arena where emotions rule supreme? We think not. Certainly, irrational behavior can drive prices for some stocks in some sectors in the short term. And for shorter periods of time, even the market as a whole can lose touch with economic fundamentals. But in the long term, the facts clearly show that individual stocks and the market as a whole track return on invested capital (ROIC) and growth. For this reason, managers should continue to make decisions based on these fundamental value drivers. By doing so, managers can also detect and perhaps exploit any irrational market deviations if and when they occur.

In this chapter, we'll explain how a market with different types of investors can lead to rational prices most of the time, even if some of the investors don't make decisions based on economic fundamentals. Then we'll show the empirical evidence that growth and ROIC are, in fact, the key drivers of value. Finally, we'll explode the myths behind a number of commonly accepted beliefs that are at odds with the fundamental principles of valuation.

[1]See R. Shiller, "When a Stock Market Is Contagious," *New York Times*, October 18, 2014.
[2]See W. Gross, "Cult Figures," *Investment Outlook* (PIMCO), August 2012.

MARKETS AND FUNDAMENTALS: A MODEL

We use a straightforward model to illustrate how market trading by both fundamental, or informed, investors and nonfundamental investors (what we call "noise traders") will produce prices that are generally in line with intrinsic value but can still be volatile.[3] These prices may even deviate significantly from intrinsic value under certain, albeit rare, conditions.

Assume a basic market where trading is limited to only one company's stock and a risk-free asset (for comparison). Two types of investors trade in this market. Informed investors develop a point of view about the intrinsic value of the company's shares based on its underlying fundamentals, such as return on capital and growth. They base their buy and sell decisions on this informed point of view. They may not all agree on the intrinsic value. Some may believe the company's shares are worth $40, others $50, and others $60. Because of transaction costs and uncertainty about the intrinsic value, they will trade only if the stock price deviates by more than 10 percent from their value estimates.

The other type of investors in this market are the noise traders. These traders may be news oriented, trading on any event that they believe will move the share price in the near term, without having a point of view on the company's intrinsic value. Noise traders can also trade on momentum, basing their trades only on price trends: when shares are going up, they buy, assuming the price will continue to increase, and when prices are going down, they sell.[4]

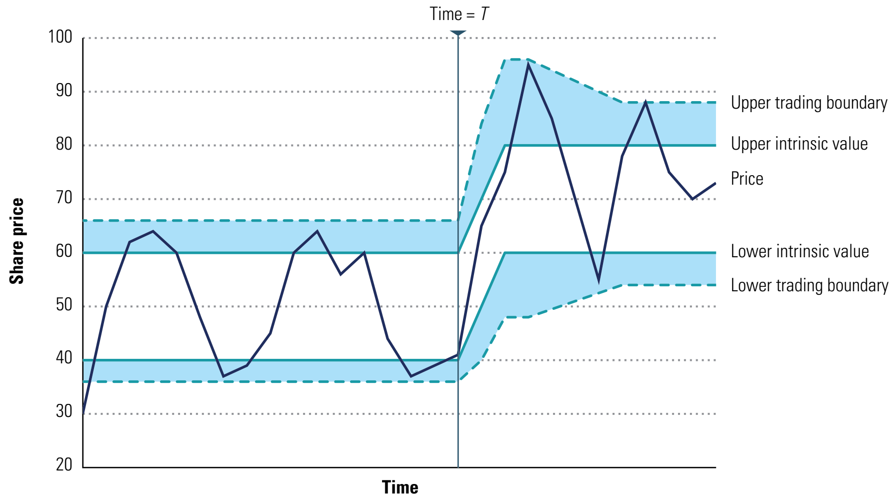
Say trading starts when the price of a single share in the market is $30. Informed investors start buying shares because they believe the shares should be worth $40 to $60; this buying drives up the share price. Some noise traders notice the rising share price and begin to purchase as well. This accelerates the share price increase, attracting more and more noise traders to jump on the bandwagon. As the share price increases, the informed investors gradually slow their purchases. At $44 the most pessimistic begin to sell. Once the price passes $66, all informed investors are selling. Momentum declines, which some of the noise traders sense, so they begin to sell as well. The selling pressure builds, and the stock price begins to fall. The noise investors accelerate the fall, but this slows as more and more informed investors begin to buy until, at $36, all informed investors are buying again and the fall is reversed.

The pattern continues, with the share price oscillating within a band whose boundaries are set by the informed investors, as shown in Exhibit 5.1. If the

[3]Nonfundamental investors could be called "irrational" because they don't make decisions based on an economic analysis of a company. We call them nonfundamental, because their strategies might be rational and sophisticated even though not based on fundamentals.

[4]Our two investor groups are quite similar to feedback traders and smart-money investors, as in W. N. Goetzmann and M. Massa, "Daily Momentum and Contrarian Behavior of Index Fund Investors," *Journal of Financial and Quantitative Analysis* 37, no. 3 (September 2002): 375–389.

EXHIBIT 5.1 **Model of Share Price Trading Boundaries**



noise traders act not only on price movements but also on random, insignificant events, there will also be price oscillations within the band. The band itself can change over time, depending on the uncertainty among informed investors about the company's intrinsic value. For example, product launches or successes in research and development can lead informed investors to increase their value estimates as well as their trading bandwidth. As a result, price volatility will be temporarily higher while they are absorbing the new information, as shown in the period after time *T* in Exhibit 5.1.

In this model, prices will move within the bandwidth if there is sufficient informed capital. This mechanism can break down, but only in rare situations. For example, when fundamental investors are vastly outnumbered by noise traders, their sales of stocks might not be able to stop a price rally. Such circumstances are unlikely, given the amounts of capital managed by sophisticated, professional—that is to say, fundamental—investors today.[5] Nevertheless, once they have sold all the overvalued stock, some fundamental investors can be reluctant to engage in short sales for fear of losing significant amounts before prices revert to higher levels. Others can face institutional or regulatory restrictions. As a result, the price rally might continue. But noise traders cannot push share prices above their intrinsic levels for prolonged periods; at some point, fundamentals prevail in setting prices in the stock market. In extreme

[5]This is also what the academic literature predicts: informed investors outweigh and ultimately survive noise traders. See, for example, L. Blume and D. Easley, "Market Selection and Asset Pricing," in *Handbook of Financial Markets: Dynamics and Evolution*, ed. T. Hens and K. Hoppe (Amsterdam: Elsevier, 2009); and J. De Long, A. Shleifer, L. Summers, and R. Waldman, "The Survival of Noise Traders in Financial Markets," *Journal of Business* 64, no. 1 (1991): 1–19.

cases, such as the technology bubble of the 1990s, this could take a few years, but the stock market always corrects itself to align with the underlying fundamental economics.

MARKETS AND FUNDAMENTALS: THE EVIDENCE

Even some of the most conventional beliefs about the stock market are not supported by the facts. For example, most growth and value indexes, like those of Standard & Poor's, categorize companies as either "value" or "growth" based on a combination of factors, including market-to-book ratios and price-to-earnings (P/E) ratios. Typically, companies with high market-to-book ratios and high P/Es end up in the growth category, while the others fall in the value category. However, growth is only one factor driving differences in market-to-book ratios and P/Es. ROIC also is important. In fact, we have found no difference in the distribution of growth rates between so-called value and growth stocks (see Exhibit 5.2). We did, however, find that so-called growth stocks tend to have high ROICs, and value stocks have lower ROICs. The median return on capital for so-called value companies was 15 percent, compared with 35 percent for the growth companies. So the companies classified as growth did not grow faster on average, but they did have higher returns on capital. That's why a modestly growing company, like the tobacco company Philip Morris International, ends up on the growth-stock list.

Similarly, market bubbles and crises have always captured public attention, fueling the belief that the stock market moves in chaotic ways, detached

EXHIBIT 5.2 **Distribution of Growth Rates for Growth and Value Stocks**

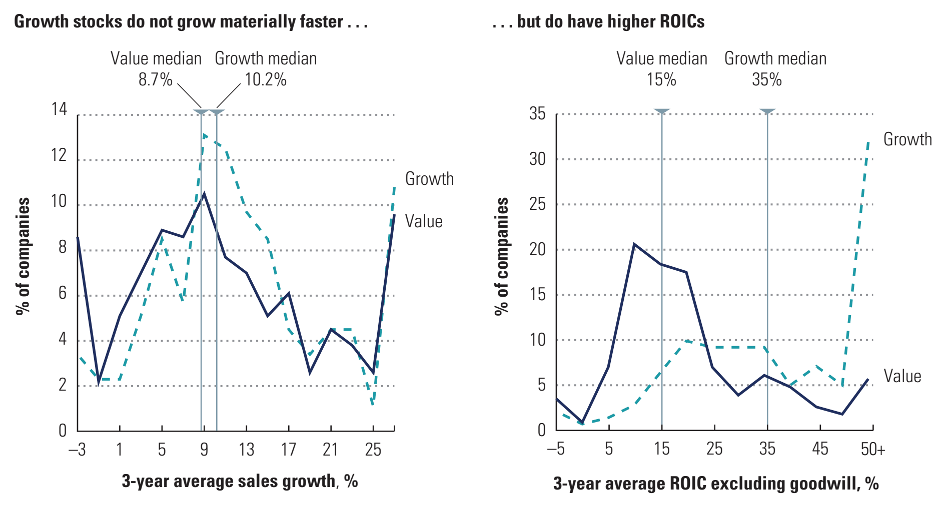
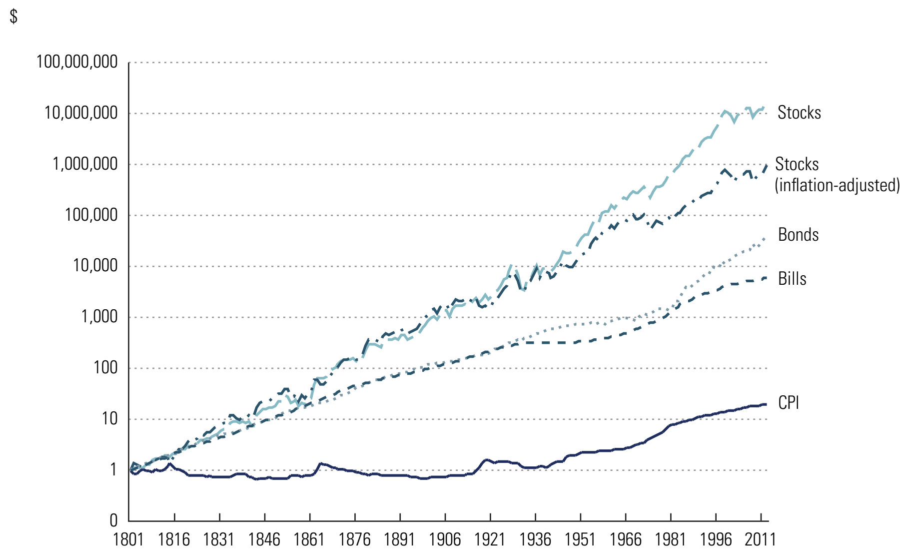


EXHIBIT 5.3 **Stock Performance against Bonds in the Long Run, 1801–2013**



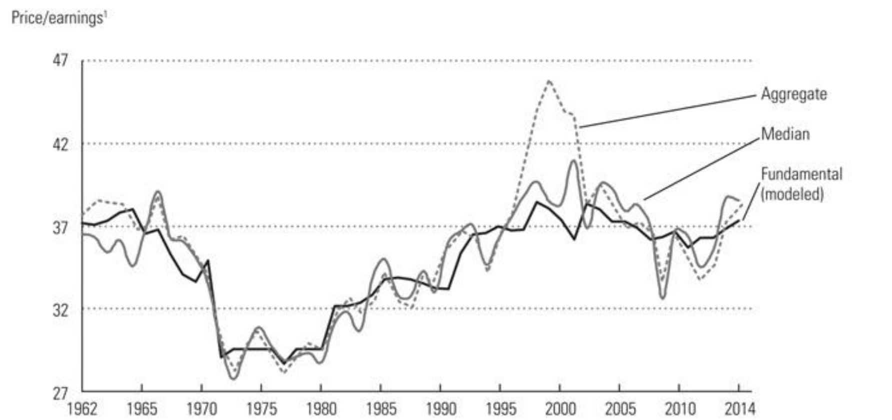
Source: Jeremy J. Siegel, *Stocks for the Long Run: The Definitive Guide to Financial Market Returns and Long-Term Investment Strategies* (New York: McGraw-Hill; 2014); Ibbotson Associates; Morningstar EnCorr SBBI Index Data.

from economic fundamentals. The 2008 financial crisis, the technology bubble of the 1990s, the Black Monday crash of October 1987, the leveraged-buyout (LBO) craze of the 1980s, and, of course, the Wall Street crash of 1929 appear to confirm such ideas. But the facts tell a different story. In spite of these events, U.S. equities over the past 200 years have delivered decade after decade of consistent returns to shareholders of about 6.5 percent annually, adjusted for inflation. Over the long term, the stock market is far from chaotic (see Exhibit 5.3).

The origins of this 6.5 percent inflation-adjusted total returns to shareholders (TRS) lies in the fundamental performance of companies and the long-term cost of equity. Unadjusted for inflation, TRS is simply the sum of the percentage share price appreciation plus the cash yield. Over the past 70 years, real corporate profits in the United States have grown about 3.0 to 3.5 percent per year, and the median P/E has hovered around a level of about 15.[6] If P/Es revert to a normal level over time, share price appreciation should therefore amount to around 3.0 to 3.5 percent per year. In addition, corporate America, as a whole, typically reinvests about 50 percent of its profits every year to achieve this profit growth, leaving the other half to be paid to shareholders as dividends and share repurchases. This translates to a cash yield to shareholders of

[6]Note that the P/E is stable if long-term growth rates, returns on capital, and costs of equity are stable.

EXHIBIT 5.4 **Estimating Fundamental Market Valuation Levels**



[1] 12-month forward-looking price-to-earnings ratio for the S&P 500.

about 3.0 to 3.5 percent at the long-term average P/E of 15.[7] Adding the cash yield to the annual 3.0 to 3.5 percent share price appreciation results in total real shareholder returns of about 6.5 percent per year.

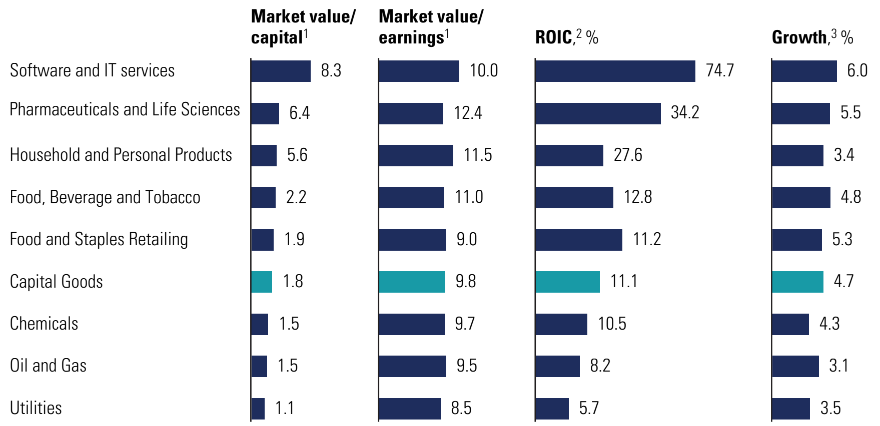
The fundamental performance of companies and of the economy also explains the level of the stock market over shorter periods of time. We estimated a fundamental P/E for the U.S. stock market for each year from 1962 to 2014, using a simple equity discounted-cash-flow (DCF) valuation model following the value driver formula first presented in Chapter 2. We estimated what the price-to-earnings ratios would have been for the U.S. stock market for each year, had they been based on these fundamental economic factors. Exhibit 5.4 shows how well a simple, fundamental valuation model fits the stock market's actual P/E levels over the past five decades, despite periods of extremely high economic growth in the 1960s and 1990s, as well as periods of low growth and high inflation in the 1970s and 1980s. By and large, the U.S. stock market has been fairly priced and in general has oscillated around its fundamental price-to-earnings ratios. Note that both the fundamental and actual P/Es have shown an upward trend over the past 30 years, driven by increasing margins and returns on capital.[8] We did a similar analysis for the European stock markets and obtained similar results.

What holds for the stock market as a whole also holds across industries. For selected industry sectors of the largest listed companies in the world in

[7]The payout ratio is driven by a company's growth and its return on capital. The 50 percent payout ratio is based on a typical company earning a 12 to 13 percent return on equity and growing at 3.5 percent in real terms, or 5 to 6 percent including inflation. The cash yield of 3.5 percent equals the inverse of the price-to-earnings ratio times the payout ratio.
[8]See also Chapter 6 and R. Jain, B. Jiang, and T. Koller, "What's behind This Year's Buoyant Market," *McKinsey on Finance*, no. 52 (Autumn 2014): 27–31.

EXHIBIT 5.5 **Market Value vs. ROIC and Growth across Selected Industry Sectors**

Global companies with real revenues > US $1 billion, 2013 median



[1] Market value is enterprise value, capital is invested capital excluding goodwill and other intangibles, and earnings is earnings before interest, tax, depreciation, and amortization (EBITDA).
[2] Average return on invested capital excluding goodwill over 2011–2013.
[3] Analyst consensus forecast of annual revenues growth over 2014–2016.

Source: Institutional Brokers' Estimate System.

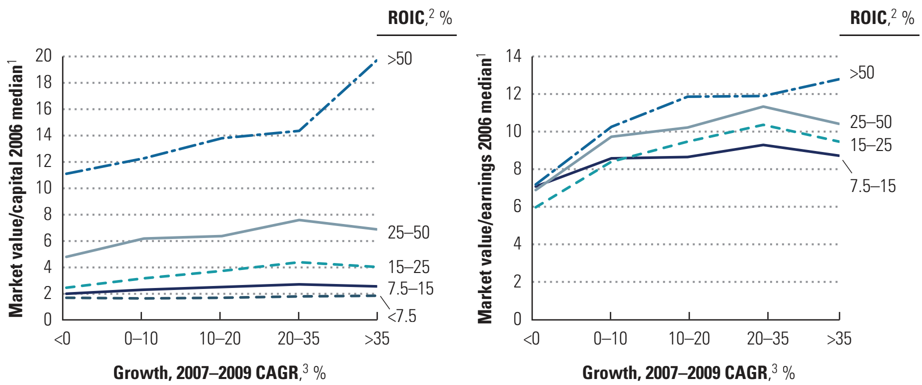
2013,[9] we took their average ROIC for the previous three years as a proxy for expected future returns, and used the analysts' consensus estimate of their three-year growth outlook as the proxy for long-term expected growth (see Exhibit 5.5). Industries with higher ratios of market value to capital or market value to earnings also have higher growth and/or higher ROIC driven by better sales margins and capital turnover. Software and pharmaceutical companies had the highest valuation levels, thanks to having the highest ROICs combined with superior growth. Oil and gas companies and utilities were valued at low market-value-to-capital multiples because of their low return on capital and low expected growth. Manufacturers of household and personal products enjoyed high valuation levels thanks to their superior ROIC even though their growth expectations were below average. Note that the ratios of market value to earnings show less variation across sectors, reflecting investor expectations of converging earnings growth in the long term. For example, software and IT services companies scored highest on ROIC and growth but not on earnings multiple because of anticipated sales margin pressure over the long term.

The same principles apply to individual companies. We compared the ratios of market value to capital of the world's 1,700 largest listed companies by market capitalization in 2006 versus their expected ROIC and growth. Exhibit 5.6 shows that, for any level of growth, higher rates of ROIC lead to higher market values, and above a given level of ROIC, higher growth also leads to

[9] This sample comprises 2,738 listed companies (excluding financial institutions) with revenues exceeding $1 billion from the United States, Europe, Australia, New Zealand, and Japan.

EXHIBIT 5.6 **Market Value, ROIC, and Growth: Empirical Relationship**

Largest global companies by 2006 market capitalization (excluding financial institutions)



[1] Market value equals enterprise value, capital is invested capital excluding goodwill, and earnings is earnings before interest, taxes, depreciation, and amortization (EBITDA).
[2] Average return on invested capital excluding goodwill over 2004–2009.
[3] Analyst consensus forecast of annual earnings growth for 2007–2009.

Source: Institutional Brokers' Estimate System.

higher value. Although the empirical results do not fit the theoretical model perfectly, they still clearly demonstrate that the market values companies based on growth and ROIC.[10]

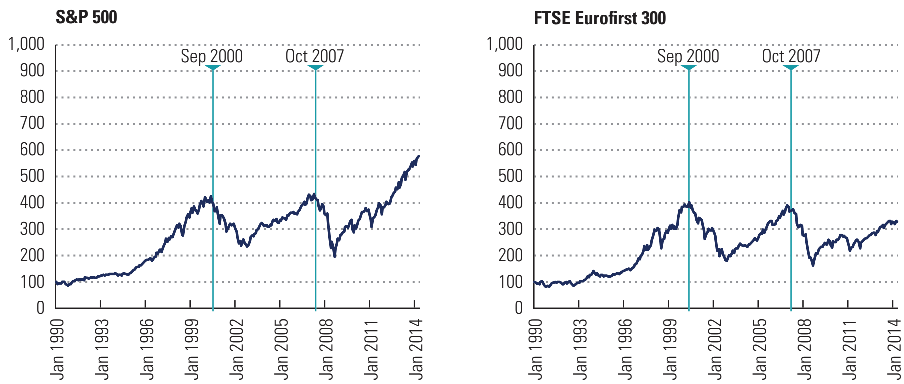
Nevertheless, there have been periods when deviations from economic fundamentals were so significant and widespread that they affected the stock market as a whole. Two recent examples are the technology bubble that burst in 2000 and the credit bubble that collapsed in 2007 (see Exhibit 5.7).

The technology market boom is a classic example of a valuation bubble, in which stocks are priced at earnings multiples that underlying fundamentals cannot justify. When Netscape Communications became a public company in 1995, it saw its market capitalization soar to $6 billion on an annual revenue base of just $85 million. As investors quickly became convinced that the Internet would change the world, they sent the Standard & Poor's (S&P) 500 index to a new peak of more than 1,500 in 2000. By 2001, the index had tumbled back to half that level. Although the valuation of the market as a whole was affected, the technology bubble was concentrated in technology stocks and certain very large stocks in other sectors (so-called megacaps). Before and after the bubble, the P/Es of the 30 largest companies were about the same on average as those of the other 470 companies in the index (see Exhibit 5.8). However, in 1999, the average top-30 company had a P/E of 46 times, compared with an average of

[10] On the right side, we left out the lowest-ROIC cohort from the market-value-to-earnings chart, because very small or even negative earnings tend to generate distorted market-value-to-earnings ratios.

EXHIBIT 5.7 **U.S. and European Equity Markets in High-Tech and Credit Bubbles**

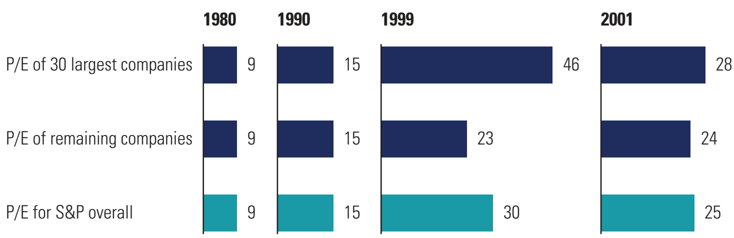
U.S. and European stock indexes (January 1990 = 100)



Source: Datastream.

EXHIBIT 5.8 **Impact of Largest Stocks on Overall Market Valuation**

12-month trailing price-to-earnings ratios



Source: Compustat.

23 times for the other 470 companies. As a result, the weighted average P/E for the market overall reached 30 times.

Most of the large-capitalization companies with high P/Es were clustered in just three sectors: technology, media, and telecommunications (TMT). Of course, some of the companies born in this era (including Amazon.com and eBay) have created and are likely to continue to create substantial economic value. But for every solid, innovative new business idea, there were dozens of companies that forgot or purposely threw out fundamental rules of economics.

By 2007, stock markets around the world had more than recovered from the technology bubble fallout, and the S&P 500 reached a new peak value in excess of 1,500 (see Exhibit 5.7). This time, the market rode to its peak on the back of an earnings bubble instead of a valuation bubble.[11] The largest property boom and credit expansion in U.S. and European history drove corporate earnings to exceptional levels that ultimately proved unsustainable. Aggregate return on equity (ROE) had shot up to 23 percent in 2006, well above the 13.6 percent median ROE from 1962 to 2006. Combined with exceptional growth, the record returns on capital caused the ratio of total profits to gross domestic product (GDP) to jump to an unprecedented 5.7 percent in 2006—much higher than the historical average of about 2.3 percent, and easily surpassing the previous record of 4.5 percent, set in 2000.[12] Although all companies were affected, this bubble too was mainly driven by a few sectors. The financial, energy, utilities, and materials sectors showed sharply inflated earnings from 41 percent of total S&P earnings in 1997 to 51 percent in 2006. But in 2007, a chain reaction of collapsing funding structures for mortgages and other forms of credit brought financial institutions across the world into distress. Stock markets worldwide lost more than half of their value as the world's economy experienced the steepest downturn since the 1930s. By 2009, before the recession bottomed out, the stock market had largely corrected itself to valuation levels more in line with sustainable profits.

Paradoxically, the fact that market deviations do occur from time to time makes it even more important for corporate managers and investors to understand the true, intrinsic value of their companies; otherwise, they will be unsure how to exploit any market deviations, if and when they occur. For instance, they might use shares to pay for acquisitions when those shares are overvalued by the market, or they might divest particular businesses at times when trading and transaction multiples in those sectors are higher than underlying fundamentals can justify.

WHAT ABOUT EARNINGS?

So far, we've made the positive case for managers to focus their energy on growth at an attractive ROIC. Yet some companies go to great lengths to achieve a certain earnings per share (EPS) number or smooth out their earnings. This is wasted energy. The evidence shows that these efforts aren't worth it, and they may actually hurt the company.

We're not saying that earnings don't matter. Companies that create value often have attractive earnings growth, and earnings will equal cash flow over the life span of the company. But as we've pointed out, earnings growth without a return on invested capital exceeding the cost of capital will destroy value.

[11] The median forward P/E in June 2007 was 40 percent lower than in 2000 and not far from P/E levels in the 1960s, when inflation and interest rates were at similar levels.
[12] Defined for the companies on the S&P 500 index as total net income before extraordinary items.

Similarly, earnings growth based purely on cost cutting, not organic revenue growth, is not sustainable.

In this section, we'll show that the sophisticated investors who drive stock market values dig beneath a company's accounting information in order to understand the underlying economic fundamentals. A classic example is the share price reaction to changes in inventory accounting by U.S. companies in the 1960s and 1970s. Because of rising price levels in these years, changing from first-in first-out (FIFO) to last-in first-out (LIFO) accounting decreased reported profits as well as taxable income. But the investor reaction reflected by the share price was typically positive, because investors understood that free cash flows would be higher as a result of lower taxes.[13]

Sometimes investors have difficulty detecting the true economic situation behind accounting information. For example, the financial reports of many banks and insurance companies are so opaque that it is difficult for investors to assess those businesses' true returns on capital and risks. Some companies, including Enron and WorldCom, have misled stock markets by purposely manipulating their financial statements. But all managers should understand that markets can be mistaken or fooled for only so long. Sooner or later, share prices need to be justified by cash flows rather than accounting earnings.

Earnings from Mergers and Acquisitions (M&A)

It's relatively easy for companies to increase their earnings by buying another company. Say a company has $1 billion of excess cash. It uses the cash to buy another company earning $50 million per year at a P/E multiple of 20 times. Its earnings will increase by $50 million, less the forgone interest it was earning on the excess cash—say, $5 million (at a 0.5 percent after-tax return on cash)—for a net increase of $45 million. Though its earnings have increased, we can't tell whether it has created value. At a 20 P/E purchase price, it will be earning only 5 percent on its invested capital. If it has a 10 percent cost of capital, it will need to double the earnings of the acquired company to earn its cost of capital on the $1 billion it just invested. Investors see through the accounting earnings. Chapter 27 shows that whether an acquisition increases or decreases earnings in the first year or two after the acquisition has no correlation with the stock market's reaction to the transaction.

Decisions on acquisitions and divestments should be based on whether or not these transactions create value. That can be the case only if the combined cash flows of the business involved in the transaction increase because of additional revenues, cost reductions, or capital efficiency improvements. We come across executives and financial professionals who believe in the illusion of "multiple expansion," as we discussed in Chapter 3. This assumes that the

[13]G. Biddle and F. Lindahl, "Stock Price Reactions to LIFO Adoptions: The Association between Excess Returns and LIFO Tax Savings," *Journal of Accounting Research* 20, no. 2 (1982): 551–588.

stock market will value an acquired business at the earnings multiple of the acquiring business. Any acquisition of a lower-multiple business would then lead to value creation, regardless of the businesses involved and the impact on future cash flows. Not surprisingly, there is no empirical evidence or economic logic for such expansion. The earnings multiple of two combined businesses will simply equal the weighted average of the individual earnings multiples. Any value increase must come from additional cash flows over and above those of the individual businesses.

Write-Downs

Executives are often reluctant to take the earnings hit from writing down the value of assets, assuming that investors will react negatively. Investors don't respond mechanically to write-downs. Rather, they assess what information the write-down conveys about the future performance of the company.

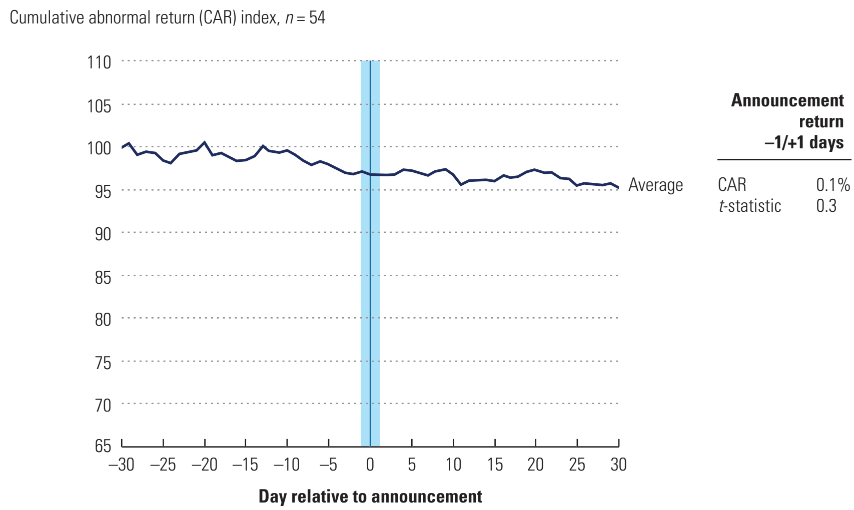
We looked at 99 companies in the United States that had written off at least $2 billion of impaired goodwill against their profits from 2007 to 2011.[14] There was no statistically significant drop in share prices on the day a write-off was announced. The markets had already anticipated the lower benefits from past acquisitions and reduced the share prices long before the write-off announcements. For example, prices jumped nearly 10 percent when Boston Scientific announced a $2.7 billion write-down associated with its 2006 acquisition of Guidant. Prices rose almost 8 percent when U.S. Steel announced a goodwill impairment charge of $1.8 billion with its third-quarter earnings in 2013. We found a similar pattern for the 15 largest goodwill impairments by European companies from 2010 to 2012. The pattern is consistent over many years. Exhibit 5.9 shows there is no statistically significant drop in share prices on the announcement of goodwill impairments in an earlier sample of 54 companies in the United States and Europe from 2002 to 2004.[15]

Stock markets clearly look at the underlying cash flows and business fundamentals rather than reported earnings and goodwill impairments. In the 2010 to 2012 sample of European write-offs, in fact, only one analyst report issued after one announcement even commented on the size of the impairment. Analysts did, however, comment strongly on indications of how the company would move forward. Changes in signals or explicit guidance about future operating earnings, the outlook for the market and business units, and any management actions or plans to address changing conditions are important.

[14]See B. Cao, M. Goedhart, and T. Koller, "Goodwill Shunting: How to Better Manage Write-Downs," *McKinsey on Finance*, no. 50 (Spring 2014): 13–15.

[15]The sample comprises selected U.S. and European companies with a market capitalization of at least $500 million and an impairment charge of at least 2 percent of market capitalization.

EXHIBIT 5.9 **No Market Reaction to Announcement of Goodwill Impairment**



Source: SEC filings, Datastream, Bloomberg.

Employee Stock Options

In the early 2000s, proposed new accounting rules requiring employee stock options to be expensed in the income statement caused much concern. Some executives and venture capitalists claimed that expensing stock options would reduce the earnings of small high-growth companies so much that they would not be able to take the companies public.

Of course, there was no need for concern, because stock prices are driven by cash flows, not reported earnings. Academic research has shown that the stock market already took account of employee options in its valuation of companies that give full information about their options schemes—even when the option values are not explicitly expensed in the companies' income statements.[16] In fact, companies that voluntarily expensed their employee options before it became mandatory experienced no decrease in share price, despite the negative implications for reported earnings.[17]

We came to a similar conclusion after examining 120 U.S. companies that began expensing their stock options between July 2002 and May 2004. Furthermore, we found no relationship between the size of the earnings decrease due to option expensing and any abnormal returns during the days surrounding

[16]D. Aboody, M. Barth, and R. Kasznik, "SFAS No. 123 Stock-Based Compensation Expense and Equity Market Values," *Accounting Review* 79, no. 2 (2004): 251–275.
[17]D. Aboody, M. Barth, and R. Kasznik, "Firms' Voluntary Recognition of Stock-Based Compensation Expense," *Journal of Accounting Research* 42, no. 2 (December 2004): 251–275.

the new policy's announcement. The market already had the relevant information on the option plans and was not confused by a change in reporting policy.

Different Accounting Standards

Share price data for companies that report different accounting results in different stock markets provide additional evidence that stock markets do not take reported earnings at face value. Non-U.S. companies that have securities listed in the United States and do not report under U.S. Generally Accepted Accounting Principles (GAAP) or International Financial Reporting Standards (IFRS), for example, are still required to report equity and net profit under U.S. GAAP.[18] These can give results that differ significantly from the equity and net profit reported under their domestic accounting standards. We analyzed a sample of 50 European companies that began reporting reconciliations of equity and profit to U.S. GAAP after obtaining U.S. listings between 1997 and 2004. The differences between net income and equity under U.S. and local accounting standards were often quite large; in more than half the cases, the gap was more than 30 percent.

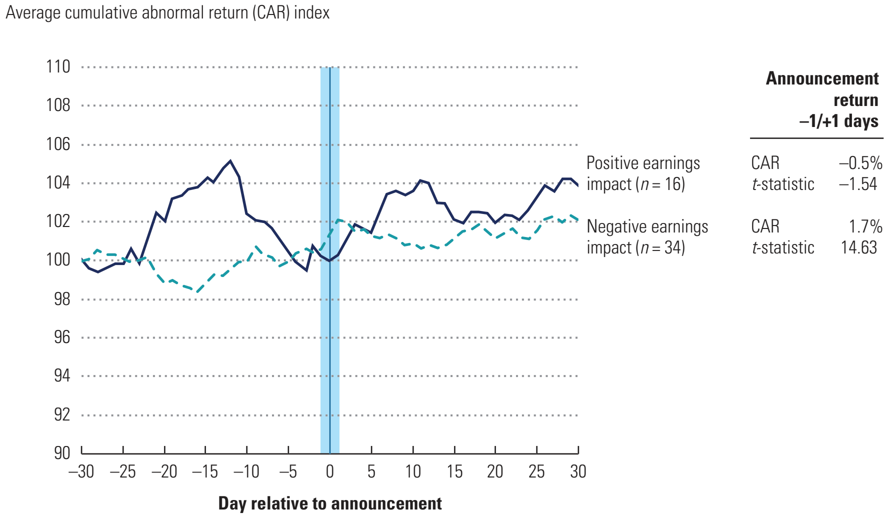
Many executives probably worried that lower earnings under U.S. GAAP would translate directly into a lower share price. But this was not the case. As shown in Exhibit 5.10, even though two-thirds of the companies in our sample reported lower earnings following U.S. disclosure, the stock market reaction to their disclosure was positive. At that time, following U.S. GAAP standards also generally meant disclosing more information than required by local standards. Evidently, improved disclosure outweighed any artificial accounting effects.

EARNINGS MANAGEMENT

On February 13, 2013, cloud computing company Rackspace Hosting reported record fourth-quarter earnings of $0.21 per share, just one cent short of the $0.22 analyst consensus expectations. On the same day, its share price dropped by almost 20 percent. But the trigger for the price decline was not the company's narrowly missing its earnings target. Rather, its revenue growth had been slowing down for the fifth quarter in a row, raising concerns among investors about the company's long-term outlook. Still, events such as this have led many managers to believe that stock markets are increasingly sensitive to short-term earnings that undershoot analysts' expectations or to volatility in earnings generally. As we'll show, events like these are not driven

[18]Since March 2008, non-U.S. companies reporting under IFRS are no longer required to reconcile financial statements to U.S. GAAP in their Securities and Exchange Commission (SEC) filings.

EXHIBIT 5.10 **No Clear Impact of U.S. GAAP Reconciliations**



Source: SEC filings, Datastream, Bloomberg.

by the earnings announcement itself, but by other information that accompanies the earnings. Furthermore, investors are not much concerned by earnings volatility and offer no rewards for predictable earnings or earnings guidance.

Earnings Volatility Doesn't Matter

Some managers believe investors will pay a premium for steady earnings growth. Indeed, executives regularly cite stabilizing earnings growth as a reason for strategic actions. For example, the CEO of Conoco justified a pending merger with Phillips Petroleum in part by asserting that the merger would offer greater earnings stability over the commodity price cycle.[19]

In contrast, academic research finds that earnings variability has either limited or no impact on market value and shareholder returns. Ratios of market value to capital certainly are diminished by cash flow volatility, but not by earnings volatility. Investors see through earnings smoothing that is unconnected to cash flow.[20] In 30 years of U.S. profit data, there is no correlation between variability in EPS and a company's market value.[21] Some researchers find a statistically significant, but practically negligible, relationship between the two:

[19] Analyst teleconference, November 19, 2001.
[20] See B. Rountree, J. Weston, and G. Allayannis, "Do Investors Value Smooth Performance?" *Journal of Financial Economics* 90, no. 3 (December 2008): 237–251.
[21] J. McInnis, "Earnings Smoothness, Average Returns, and Implied Cost of Equity Capital," *Accounting Review* (January 2010).

between the 1 percent of companies with the lowest earnings volatility and the 1 percent with the highest lies a difference in market-to-book ratios of less than 10 percent.[22]

For a sample representing the largest 1,500 European companies between 2000 and 2007, we also found that variability in earnings growth rates had no meaningful effect on shareholder returns or value.[23] As shown in Exhibit 5.11, a company's earnings variability was unrelated to its total returns to shareholders (TRS) and its ratio of market value to capital, after controlling for differences in underlying performance (that is, earnings growth and ROIC) and industry sector. Long-term earnings growth, ROIC, and industry sector together explained 34 percent of TRS for the entire sample over a five-year period, while earnings variability did not explain TRS to any significant degree.

Part of the explanation for the results is that smooth earnings growth is a myth. Almost no companies demonstrate smooth earnings growth. Exhibit 5.12 shows five firms among the 10 percent of 500 large companies that had the least volatile earnings growth from 1998 to 2007.[24] Of the companies we examined, Walgreens was the only one with seven years of steady earnings growth. Only a handful had earnings growth that was steady for four or more years. Most companies with relatively stable earnings growth follow a pattern similar to the four companies other than Walgreens in Exhibit 5.12: several years of steady growth interrupted by a sudden decline in earnings. For 460 of the companies, earnings fell in at least one year of the period studied.

Meeting Consensus Earnings Estimates Doesn't Matter

When a high-profile company misses an earnings target, it certainly makes headlines, but the impact of short-term earnings on share prices should not be overstated. For example, empirical research has shown that earnings surprises explain less than 2 percent of share price volatility in the four weeks surrounding the announcements.[25] Investors place far more importance on a company's economic fundamentals than on reported earnings. Sometimes, however, short-term earnings are the only data investors have on which to base their judgment of fundamental corporate performance. In these cases,

[22] R. Barnes, "Earnings Volatility and Market Valuation: An Empirical Investigation" (LBS Accounting Subject Area Working Paper ACCT 019, 2003). The difference was 0.2, and the average market-to-book ratio for the entire sample was around 2.

[23] We followed the approach from T. Koller and S. Rajan, "Who's Afraid of Variable Earnings?" *McKinsey on Finance*, no. 4 (Summer 2002): 13–17. For each company, we estimated the variability of its annual earnings growth rate compared with its average earnings growth rate over the entire period. Our sample consisted of 1,503 European (excluding Russian) companies with a 2007 market capitalization in excess of €200 million.

[24] These were the 500 largest nonfinancial U.S. companies by revenue.

[25] W. Kinney, D. Burgstahler, and R. Martin, "Earnings Surprise 'Materiality' as Measured by Stock Returns," *Journal of Accounting Research* 40, no. 5 (December 2002): 1297–1329.

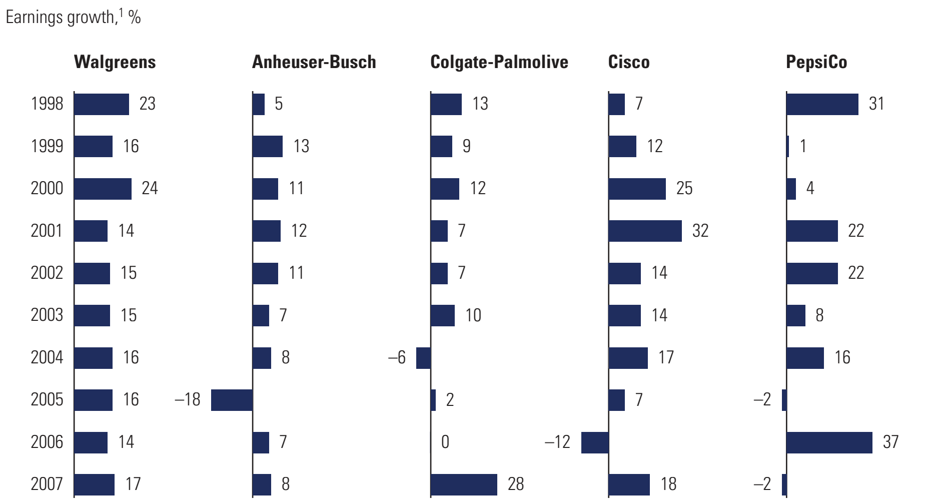
EXHIBIT 5.11 **No Relationship between Shareholder Value and Earnings Variability**

	Independent variable (*t*-statistics in parentheses)													
Dependent variable	**Constant**	**ROIC**	**EPS growth**	**EPS volatility**	**Utilities**	**Telecom**	**Technology**	**Oil and gas**	**Health care**	**Financials**	**Consumer services**	**Consumer goods**	**Basic materials**	R^2, %
TRS, 2000–2007[1]	0.071	0.082	0.378		0.026	–0.125	–0.134	0.057	–0.019	–0.035	–0.079	–0.000	0.014	31
	(8.537)	*(2.615)*	*(15.376)*		*(1.549)*	*(–4.259)*	*(–6.356)*	*(3.128)*	*(–1.155)*	*(–3.863)*	*(–6.583)*	*(–0.020)*	*(0.979)*	
TRS, 2000–2007[1]	0.089	0.032	0.396	–0.002	0.014	–0.120	–0.156	0.032	–0.026	–0.034	–0.073	–0.010	0.005	34
	(7.604)	*(0.741)*	*(11.805)*	*(–0.310)*	*(0.636)*	*(–2.316)*	*(–4.911)*	*(1.476)*	*(–1.324)*	*(–3.167)*	*(–4.729)*	*(–0.730)*	*(0.268)*	
Market value/capital[2]	1.750	11.137	0.156		–0.832	–0.221	0.309	–0.492	0.452	–1.274	–0.173	–0.519	–0.795	45
	(12.663)	*(19.692)*	*(0.406)*		*(–3.238)*	*(–0.511)*	*(0.821)*	*(–1.739)*	*(1.625)*	*(–8.853)*	*(–0.902)*	*(–2.900)*	*(–3.624)*	
Market value/capital[2]	1.114	13.014	0.445	–0.145	–0.406	–0.320	–0.457	–0.323	0.357	–1.008	0.273	–0.106	–0.425	52
	(5.844)	*(18.025)*	*(0.869)*	*(–1.775)*	*(–1.245)*	*(–0.397)*	*(–0.942)*	*(–1.019)*	*(1.150)*	*(–6.060)*	*(1.128)*	*(–0.516)*	*(–1.609)*	

[1] Annualized excess return over market return.
[2] Enterprise value/invested capital excluding goodwill. For financial institutions: market value of equity/book value of equity.

Source: Bloomberg.

EXHIBIT 5.12 **Earnings Growth of Least Volatile Companies: Not So Smooth**



[1] Earnings is defined as net income before extraordinary items, adjusted for goodwill impairment.

investors may interpret a missed EPS target as an omen of a decline in long-term performance and management credibility, so they lower the company's share price accordingly. As we describe in more detail in Chapter 30, the announcement of lower-than-expected earnings only drives share prices down in case of downward revisions of long-term fundamental prospects.

Similarly, share prices do not rise if the market believes a positive earnings surprise is simply the result of some imaginative accounting, such as deliberate timing of book gains from asset divestments or acceleration of sales from deep discounts to customers. For such accruals-dependent earnings increases, subsequent shareholder returns are poor, relative to peers.[26] And investors are wise to be wary when accruals contribute substantially to earnings, because this typically indicates that a company has reached a turning point and will post lower earnings in the future.

Earnings Guidance

Many companies believe that providing guidance on their expected earnings for the upcoming quarter or year can lead to higher valuations, lower share price volatility, and greater market liquidity for their shares at what they perceive to be limited costs. Unfortunately, there is no evidence that guidance provides any of these benefits. There is also reason to believe that the costs

[26] K. Chan, L. Chan, N. Jegadeesh, and J. Lakonishok, "Earnings Quality and Stock Returns," *Journal of Business* 79, no. 3 (2006): 1041–1082.

are substantial. As we discuss in Chapter 30, we find that whether companies issue guidance or not does not affect their earnings multiples, returns to shareholders, or share price volatility. The impact of guidance on a stock's liquidity, if any, typically disappears in the following year, making it practically irrelevant from a shareholder's perspective.[27]

However, earnings guidance could lead to significant but hidden costs. Companies at risk of missing their own forecasts could be tempted to artificially improve their short-term earnings. As described previously, that is not likely to convince the market and could come at the expense of long-term value creation. When providing earnings guidance at all, companies are therefore better off if they present ranges rather than point estimates and if they present these for underlying operational performance (for example, targets for volume and revenue, operating margins, and initiatives to reduce costs) rather than for earnings per share.

DIVERSIFICATION AND THE CONGLOMERATE DISCOUNT

Diversification is still a hotly debated topic, as we discuss in Chapter 17. Yet the myths around diversification are contradictory. One day an executive will argue that diversification creates value by smoothing a company's performance. The next day another will complain about a conglomerate discount. Neither is right.

Diversification is intrinsically neither good nor bad; it all depends on whether the parent company is the best owner for the businesses in its portfolio. But some executives believe that diversification brings benefits of its own, such as more stable aggregate cash flows, tax benefits from higher debt capacity, and better timing of investments across business cycles. However, as we discuss in Chapter 25, there is no evidence of such advantages in developed economies. Yet the costs of diversification can be very real: the business units of diversified companies often underperform their focused peers, because of added complexity and bureaucracy.

A widespread misunderstanding about spin-offs and other forms of divestment is that they are effective instruments to unlock so-called conglomerate discounts. Share price reactions to divestment announcements are typically positive, and many executives interpret this as evidence that such transactions are an easy solution to low valuations.

Key to the misunderstanding is typically a misleading sum-of-the-parts calculation. Analysts estimate the value of each of a company's businesses based on the earnings multiples of each business's industry peers. If the value of the sum of the businesses exceeds the company's current market value, the

[27]See T. Koller, B. Jiang, and R. Raj, "Three Common Misconceptions about Markets," *Journal of Applied Corporate Finance* 25, no. 3 (2006): 32–38.

analysts assume the market value includes a conglomerate discount. However, as we discuss in Chapter 17, the analyses are often based on industry peers that are not actually comparable in terms of performance or sector. When the analysis uses true industry peers, the conglomerate discount typically disappears.

Positive share price reactions to divestment announcements therefore do not represent any correction of undervaluation or oversight by investors. The reactions simply reflect investor expectations that performance will improve at both the parent company and the divested business once each has the freedom to change its strategies, people, and organization. As a large body of empirical evidence shows, investors are right in anticipating performance step-ups.[28] For example, we found that for 85 major spin-offs since 1992, both the divested businesses and the parent companies delivered significant improvements in operating profit margins over five years following the transaction (see Chapter 28).

SIZE AND VALUE

Many executives are tempted by the illusion that the absolute size or scale of a company brings benefits—in the form of higher share prices in the stock market or higher ROIC and growth in the businesses. Academics and practitioners have claimed that larger companies are in higher demand by investors because they get more coverage from equity analysts and media. Or they say the cost of capital is lower because large companies are less risky and their stocks more liquid. Higher demand and lower cost of capital should lead to higher valuation in the market.

However, there is no evidence that size matters once companies have reached a certain size. The cutoff point probably lies in the range of a market capitalization of $250 million to $500 million.[29] Only below that range is there some indication of higher cost of capital, for example. Whether a company has a market capitalization of $1 billion, $5 billion, or more does not matter for its relative valuation in the market.

The same holds for any positive effect of a company's size on its ROIC and growth. In most businesses, economies of scale make a difference only up to a certain size of the business. Large (and medium-sized) companies have

[28]See, for example, J. Miles and J. Rosenfeld, "The Effect of Voluntary Spin-Off Announcements on Shareholder Wealth," *Journal of Finance* 38 (1983): 1597–1606; K. Schipper and A. Smith, "A Comparison of Equity Carve-Outs and Seasoned Equity Offerings: Share Price Effects and Corporate Restructuring," *Journal of Financial Economics* 15 (1986): 153–186; K. Schipper and A. Smith, "Effects of Recontracting on Shareholder Wealth: The Case of Voluntary Spin-Offs," *Journal of Financial Economics* 12 (1983): 437–468; J. Allen and J. McConnell, "Equity Carve-Outs and Managerial Discretion," *Journal of Finance* 53 (1998): 163–186; and R. Michaely and W. Shaw, "The Choice of Going Public: Spin-Offs vs. Carve-Outs," *Financial Management* 24 (1995): 5–21.

[29]See R. McNish and M. Palys, "Does Scale Matter to Capital Markets?" *McKinsey on Finance* (Summer 2005): 21–23.

typically already extracted maximum benefits from such economies of scale. For example, it is tempting to believe that package-delivery companies such as FedEx or UPS can easily process more packages at limited additional costs (the planes and trucks are already in place). But the networks of these companies are finely tuned and optimized for minimum unused capacity. Increasing volume by 10 percent might in fact require 10 percent more planes and trucks.

For most companies, increases in size alone no longer automatically bring further improvements in performance but just generate more complexity. Growth often means adding more business units and expanding geographically, which lengthen the chain of command and involve more people in every decision. Smaller, nimbler companies can well end up with lower costs. Whether size helps or hurts, whether it creates scale economies or diseconomies, depends on the unique circumstances of each company.

MARKET MECHANICS DON'T MATTER

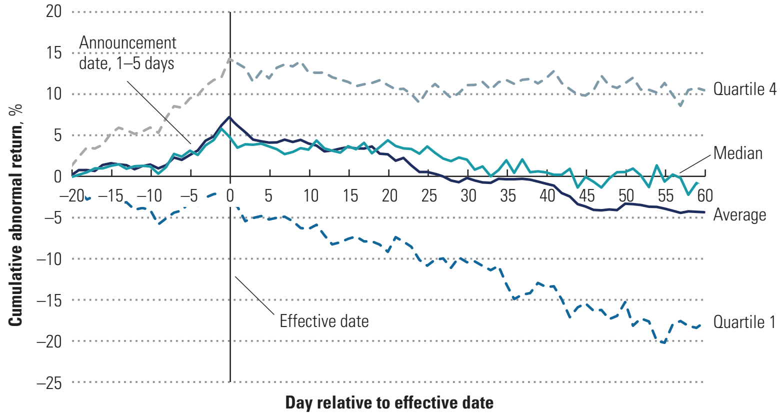
Conventional wisdom has long held that companies can capture benefits for their shareholders without any improvements to underlying cash flows by listing their stock in multiple markets, splitting their stocks, having more analyst coverage, being included in a key market index, or providing earnings guidance. True, a company from an emerging market in Asia securing a U.S. listing or a little-known European company joining a leading global stock index might secure some appreciable uplift. But well-functioning capital markets are entirely focused on the fundamentals of cash flow and revenue growth.

Index Membership

Becoming a member of leading stock market indexes such as the S&P 500 or FTSE 100 appeals to managers because many large institutional investors track these indexes. Managers believe that when institutional investors rebalance their portfolios to reflect the change of index membership, demand will shift dramatically—along with the share price. Anecdotal evidence appears to confirm this view. In 2001, Nortel, Shell, Unilever, and four other companies based outside the United States were removed from the S&P 500 index and replaced by the same number of U.S. corporations. The departing companies lost, on average, nearly 7.5 percent of their value in the three days after the announcement. The stock prices of the new entrants—including eBay, Goldman Sachs, and UPS—increased by more than 3 percent in the same period.

But empirical evidence shows that such changes are typically short-lived. On average, share prices of companies excluded from a major stock index do indeed decrease after the announcement. But this fall is fully reversed within

EXHIBIT 5.13 **Effects of Inclusion Disappear after 45 Days**



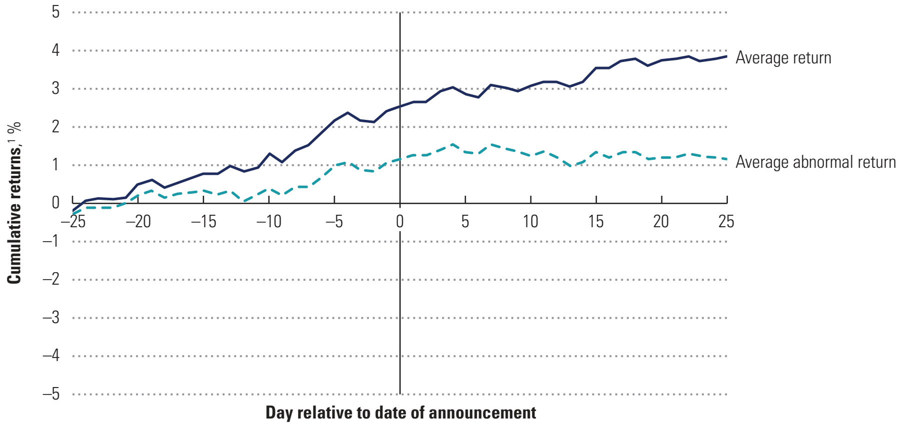
one or two months.[30] Surprisingly, the evidence on the impact of index inclusions appears less conclusive; several publications report that price increases occurring immediately after an inclusion are only partly reversed over time.[31] We analyzed the effect on share price of 103 inclusions and 41 exclusions from the S&P 500 between December 1999 and March 2004.[32] As Exhibit 5.13 shows, new entrants to the index experienced only a short-lived increase in share price: statistically significant positive returns disappeared after only 20 days, and all effects largely disappeared after 45 days. As investors adjust their portfolios to changes in the index, share prices of new entrants initially increase but then revert to normal once portfolios are rebalanced. For 41 companies ejected from the S&P 500 over the same period, we found similar patterns of temporary price change. The pressure on their prices following exclusion from the index lifted after two to three weeks.

Cross-Listing

For years, many academics, executives, and analysts believed companies cross-listing their shares on exchanges in the United States, London, and Tokyo

[30]H. Chen, G. Noronha, and V. Singal, "The Price Response to S&P 500 Index Additions and Deletions: Evidence of Asymmetry and a New Explanation," *Journal of Finance* 59, no. 4 (August 2004): 1901–1929.
[31]See also, for example, L. Harris and E. Gurel, "Price and Volume Effects Associated with Changes in the S&P 500: New Evidence for the Existence of Price Pressures," *Journal of Finance* 41 (1986): 815–830; and R. A. Brealey, "Stock Prices, Stock Indexes, and Index Funds," *Bank of England Quarterly Bulletin* (2000): 61–68.
[32]For further details, see M. Goedhart and R. Huc, "What Is Stock Membership Worth?" *McKinsey on Finance*, no. 10 (Winter 2004): 14–16.

EXHIBIT 5.14 **Delisting from U.S./UK Exchanges: No Value Impact on Companies from Developed Markets**



[1] Sample of 229 delistings from New York Stock Exchange, NASDAQ, or London International Main Market. Announcement dates between December 31, 2002, and December 31, 2007.

Source: Reuters, Bloomberg, Datastream.

could realize a higher share price and a lower cost of capital.[33] Cross-listed shares would benefit from more analyst coverage, a broader shareholder base, improved liquidity, higher governance standards, and better access to capital.

But our analysis does not find any significant impact on shareholder value from cross-listings for companies in the developed markets of North America, Western Europe, Japan, and Australia.[34] We found no decline in share price when companies announced a delisting from U.S. and UK stock exchanges (see Exhibit 5.14).[35] In fact, most announcements in our sample produced hardly any reaction from analysts and investors. Neither did we find any valuation premium for companies with cross-listings in New York or London relative to companies without any cross-listing, once we corrected for differences in return on invested capital (see Exhibit 5.15).

In fact, we did not find evidence for any of the deemed benefits from cross-listings. After correcting for size, cross-listed European companies have only marginally more analyst coverage than those not cross-listed.[36] Institutional

[33]For example, see C. Doidge, A. Karolyi, and R. Stulz, "Why Are Foreign Firms That List in the U.S. Worth More?" *Journal of Financial Economics* 71, no. 2 (2004): 205–238; and M. King and U. Mittoo, "What Companies Need to Know about International Cross-Listing," *Journal of Applied Corporate Finance* 19, no. 4 (Fall 2007): 60–74.

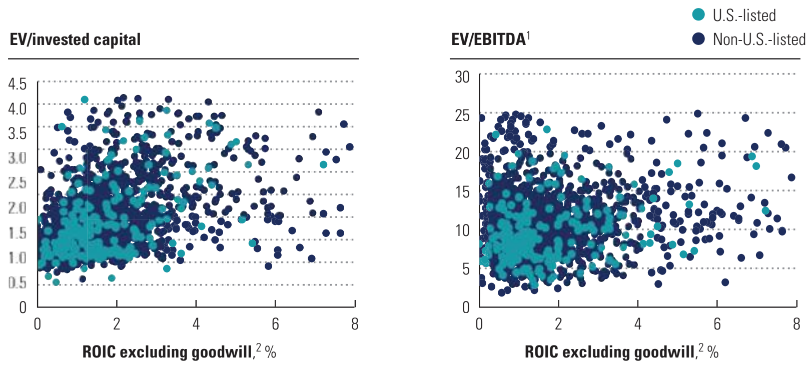
[34]For further details, see R. Dobbs and M. Goedhart, "Why Cross-Listing Shares Doesn't Create Value," *McKinsey on Finance*, no. 29 (Autumn 2008): 18–23.

[35]We analyzed the stock market reactions to 229 voluntary delistings between 2002 and 2008.

[36]See, for example, M. Lang, K. Lins, and D. Miller, "ADRs, Analysts, and Accuracy: Does Cross Listing in the U.S. Improve a Firm's Information Environment and Increase Market Value?" *Journal of Accounting Research* 41, no. 2 (May 2003): 317–345.

EXHIBIT 5.15 **U.S. Cross-Listing: No Impact on Valuation of Developed-Market Companies**

U.S.-listed and non-U.S.-listed companies in Western Europe, Japan, Canada, Australia, New Zealand



[1] Enterprise value at year-end 2006 divided by 2006 EBITDA.
[2] Average ROIC for 2004–2006.

Source: New York Stock Exchange, NASDAQ, Bloomberg, Datastream, McKinsey Corporate Performance Analysis Tool.

investors from the United States do not require the foreign companies in which they want to invest to be listed in the United States.[37] There is no impact on liquidity, as cross-listed shares of European companies in the United States—American depositary receipts (ADRs)—typically account for less than 3 percent of these companies' total trading volumes. Corporate governance standards across the developed world have converged with those in the United States and the United Kingdom. There is hardly any benefit from better access to capital, given that three-quarters of the U.S. cross-listings of companies from the European Union have never involved raising any new capital in the United States.[38]

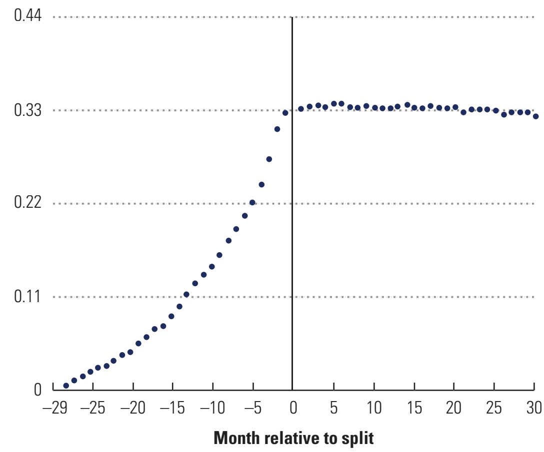
For companies from the emerging world, however, the story might be different. These companies might benefit from access to new equity and more stringent corporate governance requirements through cross-listings in U.S. or UK equity markets.[39]

Stock Splits

In the United States alone, each year hundreds of companies increase their number of shares through a stock split to bring a company's share price back

[37]For example, CalPERS, a large U.S. investor, has an international equity portfolio of around 2,400 companies, but less than 10 percent of them have a U.S. cross-listing.
[38]Based on 420 depositary receipt issues on the New York Stock Exchange, NASDAQ, and American Stock Exchange from January 1970 to May 2008. Data from the Bank of New York Mellon Corporation, www.adrbnymellon.com.
[39]See R. Newell and G. Wilson, "A Premium for Good Governance," *McKinsey Quarterly*, no. 3 (2002): 20–23.

EXHIBIT 5.16 **Cumulative Average Abnormal Returns around Stock Splits**



Source: E. Fama, L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review* 10 (1969): 1–21.

into the "optimal trading range."[40] But fundamentally, stock splits can't create value, because the size of the pie available to shareholders does not change. For example, after a two-for-one stock split, a shareholder who owned two shares worth $5 apiece ends up with four shares, each worth $2.50. But some managers and academics claim that the lower price should make the stock more attractive for capital-constrained investors, thereby increasing demand, improving liquidity, and leading to higher returns for shareholders.[41]

In many cases, a stock split is indeed accompanied by positive abnormal returns to shareholders (see Exhibit 5.16).[42] The abnormal returns have nothing to do with the split as such but are simply a function of self-selection and signaling. Self-selection is the tendency of companies to split their stocks into lower denominations because of a prolonged rise in their share price, as shown in Exhibit 5.16. As a result, one should expect any sample of companies that

[40] R. D. Boehme and B. R. Danielsen report over 6,000 stock splits between 1950 and 2000: "Stock-Split Post-Announcement Returns: Underreaction or Market Friction?" *Financial Review* 42 (2007): 485–506. D. Ikenberry and S. Ramnath report over 3,000 stock splits between 1988 and 1998: "Underreaction to Self-Selected News Events: The Case of Stock Splits," *Review of Financial Studies* 15 (2002): 489–526.

[41] There is ample evidence to show that this is not the case: after a split, trading volumes typically decline, and brokerage fees and bid-ask spreads increase, indicating lower liquidity, if anything. See T. Copeland, "Liquidity Changes Following Stock Splits," *Journal of Finance* 34, no. 1 (March 1979): 115–141.

[42] E. Fama, L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review* 10 (1969): 1–21.

have split their stocks to show positive abnormal returns in the months preceding the split announcement, which is usually one to two months before the effective split date.[43]

When managers announce a stock split, they are also signaling that they expect further improvement in economic fundamentals. The abnormal return is statistically significant for the three days around the date of the stock split announcement, at about 3 percent. Indeed, two-thirds of companies reported higher-than-expected earnings and dividends in the year following a stock split. When performance improvements actually occurred after the split, the stock market did not react, indicating that investors had already factored them into their decisions at the time of the stock split announcement.[44] Consistent with this pattern, companies that did not improve performance as expected in the year after a stock split saw their share prices fall.[45]

VALUE CREATION IS MORE IMPORTANT THAN VALUE DISTRIBUTION

Another common misconception by executives is that share repurchases and dividends create value for shareholders. This view is often reinforced by both private and public demands from investors for companies to return more cash to shareholders, particularly as share repurchases. If you dig deeper into understanding investor demands, though, you will typically find that investors want more cash distributed, not because the cash distribution itself creates value, but because investors are concerned that companies will squander excess cash and debt capacity on value-destroying investments. They view cash distributions as way to impose discipline on the company's use of its cash.[46] We discuss cash distributions extensively in Chapter 29.

In addition, counting cash distributions as value-creating would be double-counting. Companies create value when they generate cash flows. Distributing those cash flows to shareholders cannot create additional value. That would be similar to violating principles like the conservation of matter in physics.

[43]Boehme and Danielsen, "Stock-Split Post-Announcement Returns," report an average of 54 days from announcement to effective date in the years between 1962 and 1974. For the period between 1988 and 2000, this dropped to 24 days.

[44]Some researchers have reported positive abnormal returns not only in the days around but in the entire year following a split announcement, and conclude that the market is inefficient by underreacting to stock splits; see Ikenberry and Ramnath, "Underreaction to Self-Selected News Events." Others find that these abnormal returns do not lead to any arbitrage opportunities and that the market is efficient; see Boehme and Danielsen, "Stock-Split Post-Announcement Returns," and J. Conrad and G. Kaul, "Long-Term Market Overreaction or Biases in Computed Returns?" *Journal of Finance* 48 (1993): 39–63

[45]See Fama, Fisher, Jensen, and Roll, "Adjustment of Stock Prices."

[46]See for example, M. Goedhart and T. Koller, "How to Attract Long-Term Investors: An Interview with M&G's Aled Smith," *McKinsey on Finance* 46 (Spring 2013): 8–13.

So why do companies' share prices often increase on the announcement of share repurchases or dividend increases? In some cases, investors interpret dividend increases as a sign that management is confident enough about future cash flow generation to commit to a higher dividend level. That causes investors to reassess their view of future profits and cash flow generation. Often, though, as we have just noted, investors are relieved that management is less likely to squander cash on value-destroying investments, so investors again reassess their view of future cash flows. If these expectations are not met, the companies' share prices will decline later.

Another argument for share repurchases is that they increase a company's earnings per share. At a constant P/E, a higher EPS would lead to a higher share price. But P/Es do not remain constant. Share repurchases either increase a company's debt or reduce its cash. In either case, the math of finance leads to a decline in a company's P/E. Consider the case of Apple, with around $25 billion of cash by mid-2014. That cash is low risk and low return, so it has a high P/E (higher than for Apple's operating assets). Paying out that cash would reduce the proportion of high-P/E assets relative to lower-P/E assets, reducing the overall (weighted average) P/E for Apple as a whole.

Dividends and share repurchases are merely instruments for distributing cash that is generated by the company's operations. Furthermore, as we will discuss in Chapter 29, decisions about cash distributions should not drive a company's investment decisions; they should be a residual after a company has determined its strategy, its investment opportunities, and its desired level of risk.

SUMMARY

Dramatic swings in share prices over the last two decades have led some finance practitioners to suggest that long-held valuation theories have become irrelevant and that stock markets lead lives of their own, detached from the realities of economic growth and business profitability. We disagree. There is compelling evidence that valuation levels for individual companies and the stock market as a whole clearly reflect the underlying fundamental performance in terms of return on capital and growth. Yes, there are times when valuations deviate from fundamentals, but these typically do not last long. Evidence also shows that some widespread beliefs espoused by managers and finance professionals are inconsistent with the fundamental principles of valuation, and are erroneous.

We also find that executives are often overly focused on earnings and earnings growth. Earnings don't drive value in their own right; only cash flows do. Companies with attractive growth and returns on invested capital will also generate good earnings. The market sees through earnings that aren't backed up by solid fundaments, such as earnings increases from mergers and acquisitions (M&A) that don't earn adequate returns on capital. Managers should also not be concerned about noneconomic events that reduce earnings, such as asset write-downs or the effects of changes in accounting rules. Nor should they be concerned about delivering smooth earnings or meeting short-term analyst consensus earnings forecasts.

Finally, myriad myths have grown up about how the market values companies that have nothing to do with the company's economic performance. None stand up to scrutiny. There is no value premium from diversification, from cross-listing, or from size for size's sake. Conversely, there is no conglomerate discount, only a performance discount for many diversified companies. Dividends and share repurchases don't create value, but markets react positively when management signals it will be disciplined about future investments.

6

Return on Invested Capital

As Chapter 2 explains, the higher a company can raise its return on invested capital (ROIC), and the longer it can sustain a rate of return on that capital greater than its cost of capital, the more value it will create. Therefore, the ability to understand and predict what drives and sustains ROIC is critical to every strategic and investment decision.

Why do some companies develop and sustain much higher ROICs than others? Consider the difference between eBay and Webvan. In 2000, both were newcomers at the height of the tech boom. In November 1999, eBay's market capitalization was $23 billion, while Webvan's was $8 billion. eBay continued to prosper (by mid-2014 it had a market capitalization of over $60 billion). Webvan, in contrast, soon disappeared. This is not so surprising when one looks at the implications of the underlying strategies for their respective ROICs.

The core business of eBay is online auctions that collect a small amount of money for each transaction between a buyer and a seller. The business needs no inventories or accounts receivable, and requires little invested capital. Once the service started, as more buyers used eBay, more sellers were attracted to it, in turn drawing in more buyers. In addition, the marginal cost of each additional buyer or seller is close to zero. Economists say that a business in a situation like eBay's is exhibiting *increasing returns to scale*. In a business with increasing returns to scale, the first competitor to grow big can generate very high ROICs—eBay's ROIC is well over 50 percent—and will usually create the bulk of value in the market.

Webvan was an online grocery-delivery business based in California. In contrast to eBay, it had a capital-intensive business model involving substantial warehouses, trucks, and inventory. In addition, Webvan was competing with local grocery stores in selling products at very thin margins. The complexity and costs of making physical deliveries to customers within precise time frames more than offset Webvan's savings from not having physical stores. Finally, Webvan's business did not have increasing returns to scale; as demand increased, it needed more food pickers, trucks, and drivers to serve customers.

From the outset, it was clear that eBay's business model had a sound and sustainable competitive advantage that permitted high returns, while Webvan's business had no such advantage over its grocery store competitors. eBay's strategy was primed for success, while Webvan's meant it was doomed.

This chapter explores how rates of return on invested capital depend on competitive advantage, itself a product of industry structure and competitive behavior; these are the relationships that explain why some companies earn only a 10 percent ROIC while others earn 50 percent. In this chapter, we demonstrate how the ROIC of any company or industry can be explained, once we know enough about its sources of competitive advantage. We start by examining how strategy drives competitive advantage, which in turn drives ROIC, and what makes a rate of ROIC sustainable. In the final part of the chapter, we present 50 years of ROIC data by industry and over time. This analysis shows how ROIC varies by industry and how rates of ROIC fluctuate or remain stable over time.

WHAT DRIVES ROIC?

To understand how strategy, competitive advantage, and return on invested capital are linked, consider the following representation of ROIC:

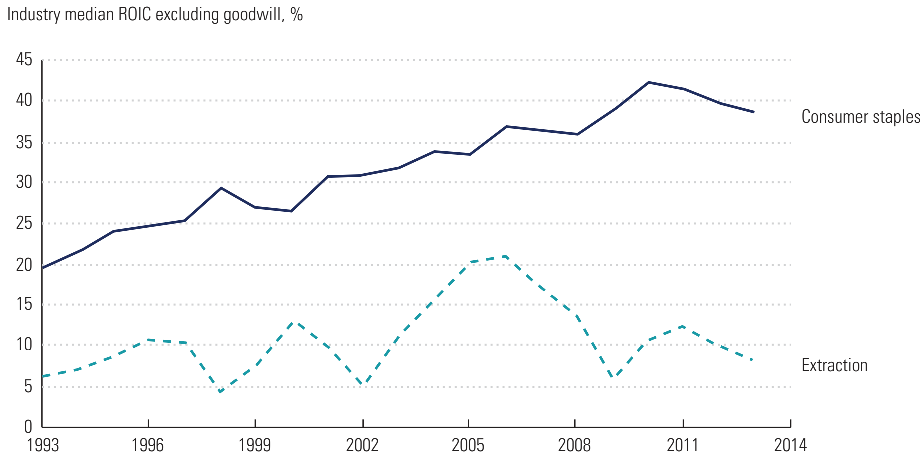
$$\text{ROIC} = (1 - \text{Tax Rate})\frac{\text{Price per Unit} - \text{Cost per Unit}}{\text{Invested Capital per Unit}}$$

This version of ROIC simply translates the typical formula of net operating profit less adjusted taxes (NOPLAT) divided by invested capital into a per unit calculation: price per unit, cost per unit, and invested capital per unit.[1] If a company has a competitive advantage, it earns a higher ROIC because it either charges a price premium or produces its products more efficiently (at lower cost or lower capital per unit or both).

The strategy model that underlies our thinking about what drives competitive advantage and ROIC is the structure-conduct-performance (SCP) framework. According to this framework, the structure of an industry influences the conduct of the competitors, which in turn drives the performance of the companies in the industry. Originally developed in the 1930s by Edward Mason, this framework was not widely influential in business until Michael Porter published *Competitive Strategy* (Free Press, 1980), applying the model to company

[1] We introduce *units* to encourage discussion regarding price, cost, and volume. The formula, however, is not specific to manufacturing. Units can represent the number of hours billed, patients seen, transactions processed, and so on.

EXHIBIT 6.1 **Company Profitability: Industry Matters**



strategy. While there have been extensions and variations of the SCP model, such as the resource-based approach,[2] Porter's framework is probably still the most widely used for thinking about strategy. According to Porter, the intensity of competition in an industry is determined by five forces: the threat of new entry, pressure from substitute products, the bargaining power of buyers, that of suppliers, and the degree of rivalry among existing competitors. Companies need to choose strategies that build competitive advantages to mitigate or change the pressure of these forces and achieve superior profitability. Because the five forces differ by industry, and because companies within the same industry can pursue different strategies, there can be significant variation in ROIC across and within industries.

Exhibit 6.1 underlines the importance of industry structure to ROIC. It compares the median return on invested capital over the past 20 years in two sectors: branded consumer staples and extraction industries (such as mining and oil and gas). Consumer staples have earned consistently higher ROICs than extraction companies. In addition, the ROICs of extraction-based companies have been highly volatile.

The reason for this difference in the industries' performances lies mainly in differences between their competitive structures. In the branded consumer staples industry, companies such as Procter & Gamble and Unilever have developed long-lasting brands with high consumer loyalty that make it difficult for new competitors to gain a foothold. In fact, consumer loyalty (along with innovative new products) has helped these companies increase their returns

[2]See, for example, J. Barney, "Resource-Based Theories of Competitive Advantage: A Ten-Year Retrospective on the Resource-Based View," *Journal of Management* 27 (2001): 643–650.

on capital from around 20 percent in 1993 to over 35 percent in 2013 as they have been able to maintain and even increase prices while reducing costs.

In extraction industries, the products of one company are the same as all others (iron ore is iron ore, with minor quality differences), so prices are the same across the industry at any point in time. In addition, the companies use the same capital-intensive processes to extract their products. So the median company in the industry doesn't have a competitive advantage, and ROICs are low, averaging only 11 percent during this 20-year period. It is worth noting that temporary imbalances in supply and demand lead to occasional spikes in ROIC. In the end, though, competition leads to low ROIC on average.

Industry structure is by no means the only determinant of ROIC, as shown by the significant variation among companies within industries. Take, for instance, the automotive industry. It has been plagued by overcapacity for years, because the industry's low returns do not deter new entrants (as shown by South Korea's entry into the U.S. market) and because unionized plants are hard to close. In the recent past, Toyota earned superior returns on invested capital because of its cost efficiencies. Its reputation for quality has also allowed Toyota to charge higher prices in the U.S. market relative to domestic manufacturers (at least until it had to make product recalls in 2009). More recently, Hyundai, the South Korean carmaker, has earned high returns as its quality has increased to the levels of the U.S. and Japanese companies and its costs have remained lower.

Finally, industry structure and competitive behavior aren't fixed; they're subject to shocks of technological innovation, changes in government regulation, and competitive entry—any or all of which can affect an entire industry or just individual companies. This is why the software industry might consistently earn high returns, but the leading companies may not be the same in 20 years, just as many of the leaders today were not major players or didn't exist 20 years ago.

COMPETITIVE ADVANTAGE

Competitive advantage derives from some combination of five sources of advantage that allow companies to charge a price premium and four sources that contribute to cost and capital efficiency (see Exhibit 6.2). It is important to understand that competitive advantage derived from these sources is enjoyed not by entire companies but by particular business units and product lines. This is the only level of competition at which the concept of competitive advantage gives you any real traction in strategic thinking; even if a company sells soup or dog food exclusively, it may still have individual businesses and product lines with very different degrees of competitive advantage, and therefore different ROICs.

EXHIBIT 6.2 **Sources of Competitive Advantage**

Price premium	Cost and capital efficiency
Innovative products: Difficult-to-copy or patented products, services, or technologies	**Innovative business method**: Difficult-to-copy business method that contrasts with established industry practice
Quality: Customers willing to pay a premium for a real or perceived difference in quality over and above competing products or services	**Unique resources**: Advantage resulting from inherent geological characteristics or unique access to raw material(s)
Brand: Customers willing to pay a premium based on brand, even if there is no clear quality difference	**Economies of scale**: Efficient scale or size for the relevant market
Customer lock-in: Customers unwilling or unable to replace product or service they use with a competing product or service	**Scalable product/process**: Ability to add customers and capacity at negligible marginal cost
Rational price discipline: Lower bound on prices established by large industry leaders through price signaling or capacity management	

On balance, price premiums offer any business the greatest scope for achieving an attractive ROIC, but they are usually more difficult to achieve than cost efficiencies. Also, the businesses or products with the most impressive returns are often those that weave together more than one advantage. Microsoft, for instance, enjoys a competitive advantage in its Office product in part because of its ability to lock in customers, and this in turn allows Microsoft to charge premium prices. Microsoft also has an advantage on the cost side because it can supply products via a simple download at extremely low marginal cost.

Price Premium Advantages

In commodity markets, companies are typically price takers, meaning they must sell at the market price to generate sales, because the products are hard to differentiate. To sell its products at a price premium, a company must find a way to differentiate its products from those of competitors. We distinguish five sources of price premiums: innovative products, quality, brand, customer lock-in, and rational price discipline.

Innovative products Innovative goods and services yield high returns on capital if they are protected by patents or difficult to copy (or both). Without either of these protections, even an innovative product won't do much to generate high returns.

Pharmaceutical companies earn high returns because they produce innovative products that, although often easy to copy, are protected by patents for up to 20 years. The business can charge a price premium during the protected period, after which generics will enter the market and drive the price down. Even after the patent expires, the holder may enjoy some price "stickiness."

An example of an innovative product line that is not patent protected but just difficult to copy was Apple's series of iPod MP3 players. MP3 players had been on the market for several years before Apple introduced the iPod, and the core technology was the same for all competitors. The iPod was more successful, however, because of its appealing design and ease of use afforded by its user interface and integration with iTunes. Apple followed a similar approach with the iPhone and iPad; once again, the design and user interface were core drivers of the price premium. Although not patent protected, good design can be difficult to copy.

Quality A term used as broadly as *quality* requires definition. In the context of competitive advantage and ROIC, quality means a real or perceived difference between one product or service and another for which consumers are willing to pay a higher price. In the car business, for example, BMW enjoys a price premium because customers perceive that its cars handle and drive better than comparable products that cost less. The cost of providing the extra quality is less than the price premium. Hence, BMW has often been able to earn higher returns than many other carmakers.

Sometimes the perception of quality lasts significantly longer than any real difference in quality, as has been the case with Honda and Toyota (at least until Toyota had to make product recalls in 2009) relative to General Motors, Ford, and Chrysler. While American and Japanese cars have been comparable in terms of quantifiable quality measures, such as the J.D. Power survey, Japanese companies have enjoyed a price premium for their products. Even when American and Japanese sticker prices on comparable vehicles were the same, American manufacturers were often forced to sell at a $2,000 to $3,000 discount, whereas Japanese cars sold for nearer the asking price.

Brand Price premiums based on brand are sometimes hard to distinguish from price premiums based on quality, and the two are highly correlated. While the quality of a product may matter more than its established branding, sometimes the brand itself is what matters more—especially when the brand has lasted a very long time, as in the cases of Coca-Cola, Perrier, Louis Vuitton, and Mercedes-Benz.

Packaged food and durable consumer goods are good examples of sectors where brands earn price premiums for some, but not all, products. In some categories of packaged foods, such as breakfast cereals, customers are loyal to brands like Cheerios despite the availability of high-quality branded and private-label alternatives. In other categories, including meat, branding has not been successful. As a result of their strong brands, cereal companies earn returns on capital of around 30 percent, while meat processors earn returns of around 15 percent.

Customer lock-in When replacing one company's product or service with another's is relatively costly for customers,[3] the incumbent company can charge a price premium—if not for the initial sale, then at least for additional units or for subsequent generations and iterations of the original product. Medical devices like artificial joints, for instance, can lock in the doctors who purchase them, because doctors need time to train and become proficient in using the device for treatment. Once doctors are up to speed on a particular device, they won't switch to a competing product unless there is a compelling reason to invest the necessary effort.

High switching costs similarly explain why Bloomberg financial terminals, although based on a relatively old technology, are still leaders in their market. Bankers and traders have invested considerable time in learning how to work with the Bloomberg terminals and are reluctant to learn another system. An installed base like Bloomberg's is a powerful driver of competitive advantage.

Rational price discipline In commodity industries with many competitors, the laws of supply and demand will drive down prices and ROIC. This applies not just to obvious commodities such as chemicals and paper, but also to more recently commoditized products and services, such as airline seats. It would take only a net increase of 5 to 10 percent in airline ticket prices to turn the industry's aggregate loss to an aggregate profit. But each competitor is tempted to get an edge in filling seats by keeping prices low, even when fuel prices and other costs rise for all competitors. Note that in the past several years, airlines have begun to be more cautious about adding seat capacity. That has allowed them to increase prices, but not enough to earn high returns on capital relative to other industries.

Occasionally, we find an industry that manages to overcome the forces of competition and set its prices at a level that earns the companies in the industry reasonable returns on capital (though rarely more than 15 percent) without breaking competition law. For example, for many years, almost all real estate agents in the United States charged a 6 percent commission on the price of each home they sold. In other cases, the government sanctions disciplined pricing in an industry through regulatory structures. Until the 1970s, airline fares in the United States were high because competitors were restricted from entering one another's markets. Prices collapsed when the market was deregulated in 1978.

Rational, legitimate pricing discipline typically works when one competitor acts as the leader and others quickly replicate its price moves. In addition, there must be barriers to new entrants, and each competitor must be large enough for a price war to be sure to reduce the profit on its existing volume

[3]Costly relative to the price of the product.

by more than any extra profit gained from new sales. If there are smaller competitors that have more to gain from extra volume than they would lose from lower prices, then price discipline will be very difficult to maintain.

Most attempts by industry players to maintain a floor price fail. Take the paper industry, for example. Its ROICs have averaged less than 10 percent from 1990 to 2013. The industry creates this problem for itself because the companies all tend to expand at once, after demand and prices have risen. As a result, a large chunk of new capacity comes on line at the same time, upsetting the balance of supply and demand and forcing down prices and returns.

Even cartels (which are illegal in most of the world) find it difficult to maintain price levels, because each cartel member has a huge incentive to lower prices and attract more sales. This so-called free-rider issue makes it difficult to maintain price levels over long periods, even for the Organization of Petroleum Exporting Countries (OPEC), the world's largest and most prominent cartel.

Cost and Capital Efficiency Advantages

Theoretically, cost and capital efficiency are two separate competitive advantages. Cost efficiency is the ability to sell products and services at a lower cost than the competition. Capital efficiency is selling more products per dollar of invested capital than competitors. In practice, both tend to have common drivers and are hard to separate. (Is a company's outsourcing of manufacturing to Asia a source of cost efficiency or capital efficiency?) Consequently, we treat the following four sources of competitive advantage as deriving from both the cost and capital efficiencies they achieve.

Innovative business method A company's business method is the combination of its production, logistics, and pattern of interaction with customers. Most production methods can be copied, but some are difficult to copy at some times. For example, early in its life, Dell developed a new way of making and distributing personal computers. Dell sold directly to its customers, made its machines to order with almost no inventory (by assembling machines with standardized parts that could be purchased from different suppliers at different times at very low cost), and received payments from customers as soon as products shipped. In contrast, Hewlett-Packard and Compaq, its dominant competitors at that time, were producing in large batches and selling through retailers. Dell's cost and capital efficiency enabled the company initially to generate a much higher ROIC than its competitors, who couldn't switch quickly to a direct-sales model without angering their retailers and reengineering their production processes.

Interestingly, Dell's success formula eroded over time as its sales shifted from desktop to notebook computers. Notebook computers are built to much tighter part specifications, often using parts from vendors made expressly for Dell. Since everything has to fit together just right, Dell needs more support from its vendors and cannot pressure them so easily by threatening to switch to other suppliers on the basis of cost alone.

Unique resources Sometimes a company has access to a unique resource that cannot be replicated. This gives it a significant competitive advantage. For example, in general, gold miners in North America earn higher returns than those in South Africa because the ore is closer to the surface, so extracting it is easier and costs less. These lower extraction costs are a primary driver of higher returns from North American mines (though partially offset by higher investment costs).

Another example is Norilsk Nickel's nickel mine in northern Siberia. The content of precious metals (e.g., palladium) in Norilsk's nickel ore is significantly higher than in the ore from Canadian and Indonesian mines. In other words, Norilsk gets not only nickel from its ore but also some high-priced palladium. As a result, Siberian mines earn higher returns than other nickel mines.

Geography often plays a role in gaining advantage from unique resources. In general, whenever the cost of shipping a product is high relative to the value of the product, producers near their customers have a unique advantage. China is now the largest consumer of iron ore. South American mines, therefore, face a distinct transportation cost disadvantage compared with Australian iron mines, which contributes to their lower returns compared with Australian mines.

Economies of scale The notion of economies of scale is often misunderstood to mean that there are automatic economies that come with size. Scale can indeed be important to value, but usually only at the regional or even local level, not in the national or global market. For example, if you're a retailer, it's much more important to be large in one city than large across the country, because costs like local warehousing and local advertising are either lumpy or fixed. Buying advertising airtime and space in Chicago is the same whether you have one store or a dozen.

A key element that determines the profitability of health insurers in the United States is their ability to negotiate prices with providers (hospitals and doctors), who tend to operate locally rather than nationally. The insurer with the highest market share in a local market will be in a position to negotiate the lowest prices, regardless of its national market share. In other words, it's better to have the number one market share in 10 states than to be number one nationwide but number four in every state.

Another aspect of economies of scale is that a company derives benefit only if the required investments in scale are large enough to deter competitors. Anyone who wants to compete with United Parcel Service (UPS) or FedEx, for instance, must first pay the enormous fixed expense of installing a nationwide network, and then operate at a loss for quite some time while drawing customers away from the incumbents. Even though FedEx and UPS continually have to add new costs (for planes, trucks, and drivers), these costs are variable—in contrast to the fixed cost of building the national network—and are incurred in stepwise fashion.

Size or scale can work against a business as well. In the 1980s, UPS was attacked by RPS, a package delivery service that differentiated its business and pricing by offering significant discounts to commercial customers in populous areas. UPS offered only modest volume discounts, charging generally the same for each package out of, say, 10 packages delivered to an office building as it did for delivering one package to a residence. In essence, RPS was picking off high-margin business from UPS, and UPS's grand scale did little to prevent this. RPS's experience teaches that what matters is having the right scale in the right market.

Scalable product or process Having products or processes that are scalable means the cost of supplying or serving additional customers is very low. Businesses with this advantage usually deliver their products and services using information technology (IT). An example is Automatic Data Processing (ADP), which provides payroll processing and related services to small and medium-sized businesses. All customers are on the same computers and software, so adding customers involves negligible cost. This highly scalable business model allows margins to increase as ADP grows. Likewise, companies such as eBay and products like Microsoft Office add customers at minuscule incremental cost.

Other examples of scalable businesses include media companies that make and distribute movies or TV shows. Making the movie or show requires an initial outlay for the crew, sets, actors, and so on. But those costs are fixed regardless of how many people end up viewing and paying for the show. There may be some incremental advertising costs and very small costs associated with putting the movie on DVD or streaming it. But overall, costs do not rise as customer numbers increase.

This is not to say that all IT-based or IT-enabled businesses are scalable. Many incur costs to service each contract with clients, more like consulting firms, which are not scalable. These costs mount with the number of clients. For example, many companies that maintain data centers do so on a cost-plus basis by adding people, equipment, and facilities as they add new clients.

SUSTAINABILITY OF RETURN ON INVESTED CAPITAL

The longer a company can sustain a high ROIC, the more value the company will create. In a perfectly competitive economy, ROICs higher than the cost of capital get competed away. Whether a company can sustain a given level of ROIC depends on the length of the life cycles of its businesses and products, the length of time its competitive advantages can persist, and its potential for renewing businesses and products.

Length of Product Life Cycle

The longer the life cycle of a company's businesses and products, the better its chances of sustaining its ROIC. To illustrate, while Cheerios may not seem as exciting as an innovative, new technology, the culturally entrenched, branded cereal is likely to have a market for far longer than any new gadget. Similarly, a unique resource (like palladium-rich nickel ore) can be a durable source of advantage if it is related to a long product life cycle but will be less advantageous if it isn't. And a business model that locks customers into a product with a short life cycle is far less valuable than one that locks customers in for a long time. Once users of Microsoft's Windows have become well-versed in the platform, they are unlikely to switch to a new competitor. Even Linux, a low-cost alternative to Windows, has struggled to gain market share as system administrators and end users remain wary of learning a new way of computing. Microsoft's success in extending the life cycle of Windows has been a huge source of value to the company.

Persistence of Competitive Advantage

If the company cannot prevent competition from duplicating its business, high ROIC will be short-lived, and the company's value will diminish. Consider a major cost improvement implemented by the airlines over recent years. The self-service kiosk allows passengers to purchase a ticket or print a boarding pass without waiting in line. From the airlines' perspective, fewer ground personnel can handle more people. So why has this cost improvement not translated into high ROICs for the airlines? Since every company has access to the technology, any cost improvements are passed directly to the consumer in the form of lower prices. In general, advantages that rise from brand and quality on the price side and scalability on the cost side tend to have more staying power than those arising from more temporary sources of advantage, such as an innovation that will tend to be superseded by subsequent innovations.

Potential for Product Renewal

Few businesses or products have life cycles as long as Coca-Cola's. Most companies need to find renewal businesses and products where they can leverage existing or build new competitive advantages. This is an area where brands prove their value. Consumer goods companies excel at using their brands to launch new products: think of Apple's success with the iPod and iPhone, Bulgari moving into fragrances, and Mars entering the ice cream business. Being good at innovating also helps companies renew products and businesses. Thus, pharmaceutical companies exist because they can discover new drugs, and a semiconductor manufacturer such as Intel relies on its technological innovation to launch new products and stay ahead of its competitors.

Some companies, such as Procter & Gamble and Johnson & Johnson, are able to protect their primary product lines while simultaneously expanding into new markets. Procter & Gamble has a strong record of continuing to introduce successful new products like Swiffer, Febreze, and Crest Whitestrips. It also anticipated the strong growth in beauty products in the early 2000s with a number of acquisitions that increased its revenues in the category from $7.3 billion to $20 billion from 1999 to 2013. Product development and renewal have enabled the company to advance from owning just one billion-dollar brand (by sales) in 1999 to 23 in 2013.

As we will see in the next section of this chapter, empirical studies show that over the past five decades companies have been generally quite successful in sustaining their rates of ROIC. Apparently, when companies have found a strategy that creates competitive advantages, they are often able to sustain and renew these advantages over many years. While competition clearly plays a major role in driving down ROIC, managers can sustain a high rate of return by anticipating and responding to changes in the environment better than their competitors do.

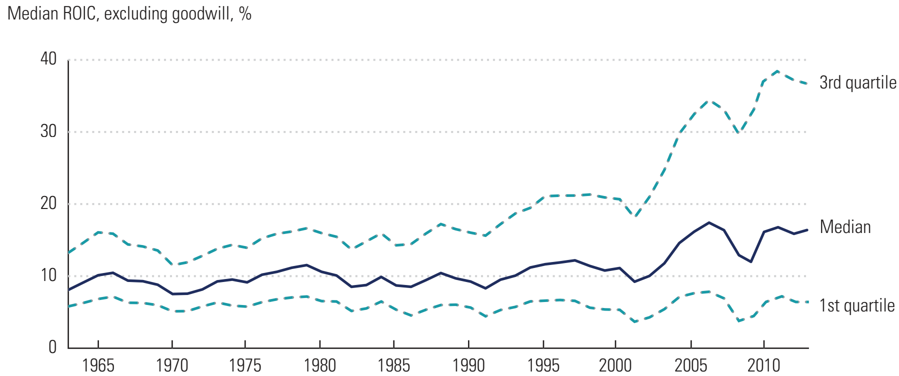
AN EMPIRICAL ANALYSIS OF RETURNS ON INVESTED CAPITAL

In our study of rates of ROIC for U.S.-based nonfinancial companies with revenues greater than $1 billion (inflation adjusted) from 1963 to 2013[4] we produced several key findings:

- The median ROIC was stable from 1963 to the early 2000s at about 10 percent, and then it increased to 16 percent in 2013. A key driver of this effect was a shift in the mix of U.S.-based companies to higher-returning sectors like pharmaceuticals and information technology, which not only grew faster, but also increased their ROICs.
- ROICs differ by industry. Industries that rely on sustainable competitive advantages such as patents and brands (for example, pharmaceuticals and personal products) tend to have high median ROICs, whereas companies in basic industries, such as paper, airlines, and utilities, tend to earn low ROICs.

[4]Our results come from McKinsey & Company's Corporate Performance Analytical Tool, which relies on financial data provided by Standard & Poor's Compustat. The number of companies in the sample varies from year to year. In 2013, the sample included 1,246 companies.

EXHIBIT 6.3 **ROIC of U.S.-Based Nonfinancial Companies, 1963–2013**



Source: McKinsey Corporate Performance Analysis Tool.

- There are large variations in rates of ROIC within industries. Some companies earn attractive returns in industries where the median return is low (e.g., Wal-Mart and Intel), and vice versa.
- Rates of ROIC tend to remain fairly stable—especially compared with rates of growth, discussed in the next chapter. Industry rankings by median ROIC are stable over time, with only a few industries making a clear aggregate shift upward or downward, typically reflecting structural changes, such as the widespread consolidation in the defense industry over the past two decades. Individual companies' ROICs gradually tend toward their industry medians over time but are fairly persistent.

ROIC Trends

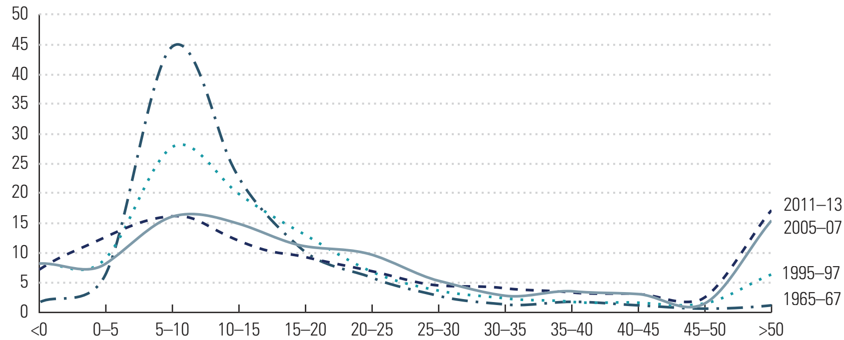
The relatively stable ROIC through the early 2000s is evident in Exhibit 6.3, which plots median ROIC between 1963 and 2013 for U.S.-based nonfinancial companies.[5] ROIC in Exhibit 6.3 excludes goodwill and acquired intangibles, which allows us to focus on the underlying economics of companies, without the distortion of premiums paid for acquisitions (which we will discuss later in the chapter).

Until the early 2000s, the average median ROIC without goodwill was about 10 percent. Furthermore, annual medians oscillated in a tight range, though with higher returns in high-GDP-growth years and lower returns in low-growth years. Since the early 2000s, however, median ROIC without goodwill has increased to about 16 percent in 2013. Notice also that the spread

[5]The numbers in this section are based on U.S. companies because longer-term data for non-U.S. companies are not readily available. In recent years, the global distribution of returns and the U.S. distribution have been very similar.

EXHIBIT 6.4 **Distribution of ROIC**

Annual ROIC,[1] excluding goodwill, %



[1] The chart has been simplified for readability. The distributions are similar between 1965 and 1995; 2011–2013 are included to show that the distribution has continued after the Great Recession.

Source: McKinsey Corporate Performance Analysis Tool.

between the 25th and 75th percentiles has widened. The 25th-percentile company has continued to earn about 6 percent during the entire period, while the 75th-percentile company's return has increased from the mid-teens to over 35 percent.

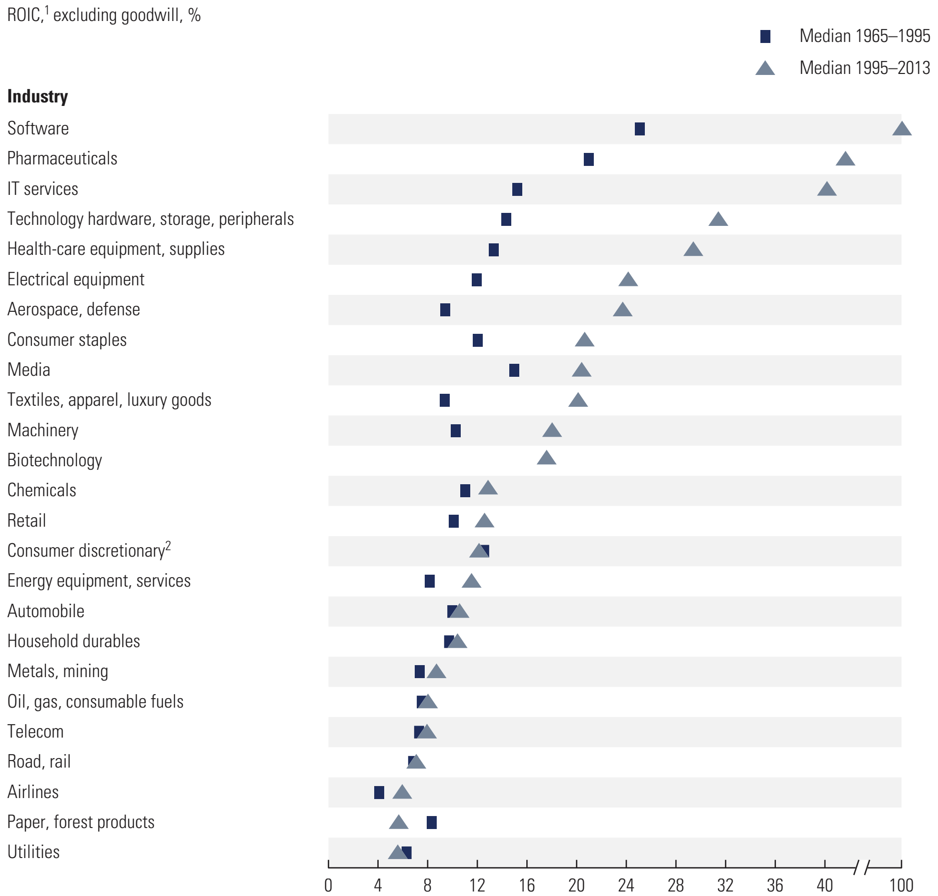
What's going on is the widening of the distribution of ROIC across companies. Exhibit 6.4 shows the distribution of ROIC in 1965–1967 overlaid on the returns in 1995–1997, 2005–2007, and 2011–2013. The distribution has flattened out as more companies earn high returns on capital. In the 1965–1967 period, only 14 percent of companies earned more than a 20 percent ROIC, compared with 53 percent in 2011–2013. At the same time, the share of companies earning less than 10 percent has declined from 53 percent to 26 percent.

Much of the increase in median ROIC and the widening dispersion is due to the changing mix of U.S.-based companies. The share of profits of U.S.-based nonfinancial companies earned by companies in pharmaceuticals, medical devices, and information technology has increased from 14 percent of total profits in 1990 to 33 percent in 2013. This massive increase has been driven by the fact that these sectors have grown faster than the rest of the economy, they tend to have higher margins and returns on capital, and their margins and returns on capital have increased (as will be discussed in the next section).

ROIC by Industry

To see how differences in ROIC across industries and companies relate to likely differences in drivers of competitive advantage, we examined variations in ROIC by industry over the past 50 years. Exhibit 6.5 shows the median

EXHIBIT 6.5 **ROIC by Industry, 1965–2013**



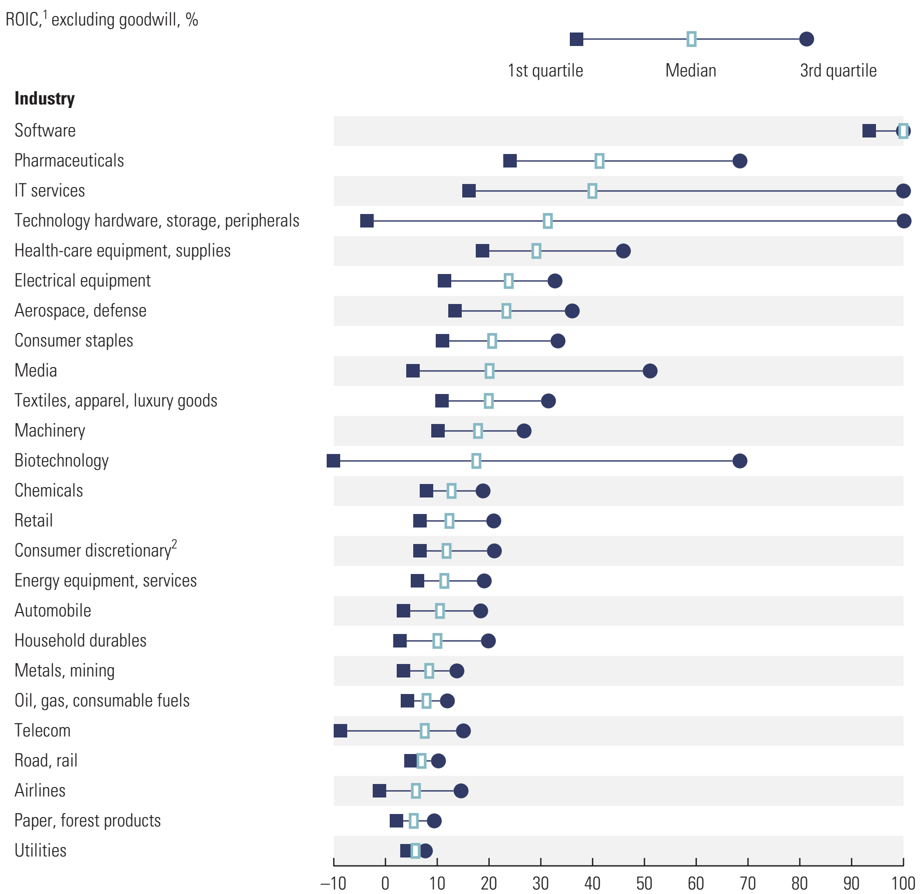
[1] Scale limited to –10% to +100% for presentation purposes.
[2] Hotels, restaurants, and leisure.
Source: McKinsey Corporate Performance Analysis Tool.

returns on invested capital for a range of industries during the periods 1965–1995 and 1995–2013. This exhibit shows the large differences in median ROICs across industries. Also, for the higher-ROIC industries, ROICs have increased in recent years. Not surprisingly, industries with the highest ROICs, such as pharmaceuticals, medical devices, and IT-related businesses, are those with sustainable competitive advantages. In the case of pharmaceuticals and medical devices, this is due to patent-protected innovation. In IT-related businesses, it is due to increasing returns to scale and customer lock-in. The consumer staples sector has high returns due to customer loyalty based on brand strength. The industries at the bottom of the chart tend to be those where it is difficult to achieve a price premium or cost advantage.

Note that some of the higher-ROIC industries have also increased their returns on capital over time. The reasons vary by sector. For example, in aerospace and defense, the leading companies are more focused on government contracts, where the government makes advance payments on contracts, keeping their invested capital very low relative to revenues. In pharmaceuticals, blockbuster drugs (some with sales of more than $5 billion per year) introduced in the late 1980s and 1990s had higher margins and returns on capital, often because of lower marketing and production costs. Finally, in software and services, the shift to more standardized scalable products contributed to higher margins and returns.

Differences in ROIC within industries can be considerable. Exhibit 6.6 shows the variation between the first and third quartiles for the same

EXHIBIT 6.6 **Variation in ROIC within Industries, 1995–2013**



[1] Scale limited to –10% to +100% for presentation purposes.
[2] Hotels, restaurants, and leisure.

Source: McKinsey Corporate Performance Analysis Tool industries. Note the wide range of returns in IT services. Some IT service companies earn low returns because they are capital intensive and have low margins because their business model is not scalable, as in the case of running data centers. Other IT services are based more on standardized software, where the incremental cost to serve a new customer is small, leading to high ROIC.

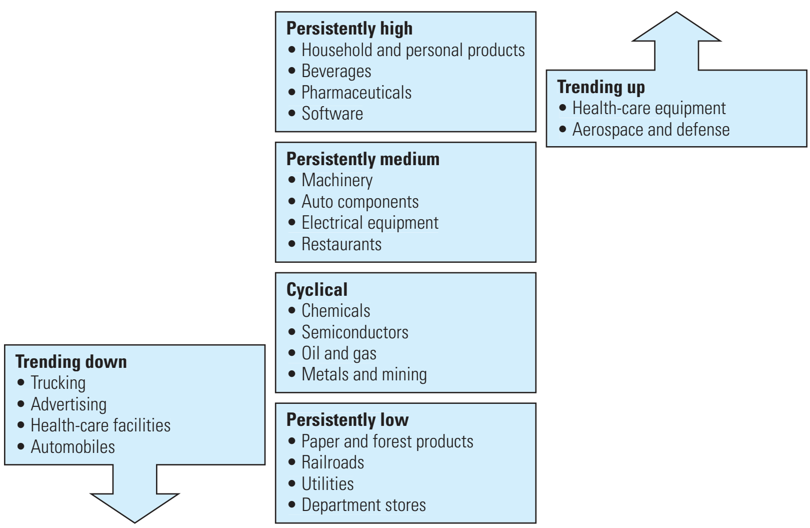
This chart also shows that the best performers in a weaker industry may outperform the median performer in stronger industry. Note that the stronger retailers (like Wal-Mart) outperform the weaker media companies.

Stability of ROIC

Although not shown in Exhibit 6.5, the industry ranking by median ROIC does not vary materially over time. Similarly, when we ranked the returns on invested capital across industries over the past 50 years into high, medium, and low groups, we found that most industries stayed in the same group over the period, as shown by Exhibit 6.7.

Persistently high-return industries included household and personal products, beverages, pharmaceuticals, and software. As you would expect, these industries have consistently high returns because they are scalable (software) or are protected by brands or patents. Persistently low returns characterize paper and forest products, railroads, and utilities. These are commodity industries in which price premiums are difficult to achieve because of low barriers to entry, commodity products, or regulated returns. Perhaps surprisingly, this group also includes department stores. Like commodity industries,

EXHIBIT 6.7 **Persistence of Industry ROICs**



department stores can achieve little price differentiation, so, as a rule, they realize persistently low returns. Some industries are cyclical, having high and low returns at different points in the cycle but demonstrating no clear trend up or down over time.

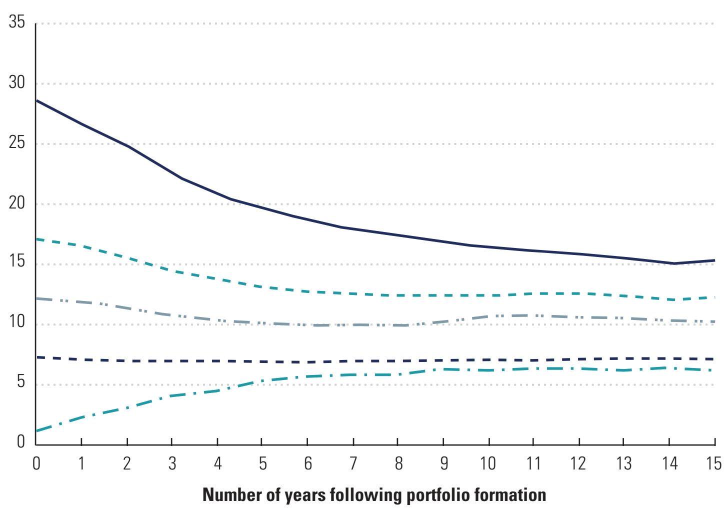
In several industries there was a clear downward trend in returns. These included trucking, advertising, health-care facilities, and automobiles. Competition in trucking, advertising, and automobiles has increased substantially over the past five decades. Health-care facilities have had their prices squeezed by the government, insurers, and competition with nonprofits.

Industries where returns on invested capital clearly are trending up are rare. Two examples are health-care equipment and aerospace and defense. Innovation in health-care equipment has enabled the industry to produce higher-value-added, differentiated products such as artificial joints, as well as more commoditized products, including syringes and forceps. As mentioned earlier, companies in aerospace and defense reduced their capital intensity as government provided up-front funding for many more contracts.

There is similar evidence of sustained rates of return at the company level. We measured the sustainability of company ROICs by forming portfolios of companies earning a particular range of ROIC in each year (e.g., above 20 percent) and then tracking the median ROIC for each portfolio over the following 15 years. Exhibit 6.8 shows some mean reversion as companies earning high returns tended to see their ROICs fall gradually over the succeeding 15 years,

EXHIBIT 6.8 **ROIC Decay Analysis: Nonfinancial Companies**

Median ROIC of portfolios (without goodwill),[1] by quintile, %



[1] At year 0, companies are grouped into one of five portfolios, based on ROIC.

Source: Compustat, McKinsey Corporate Performance Analysis Tool.

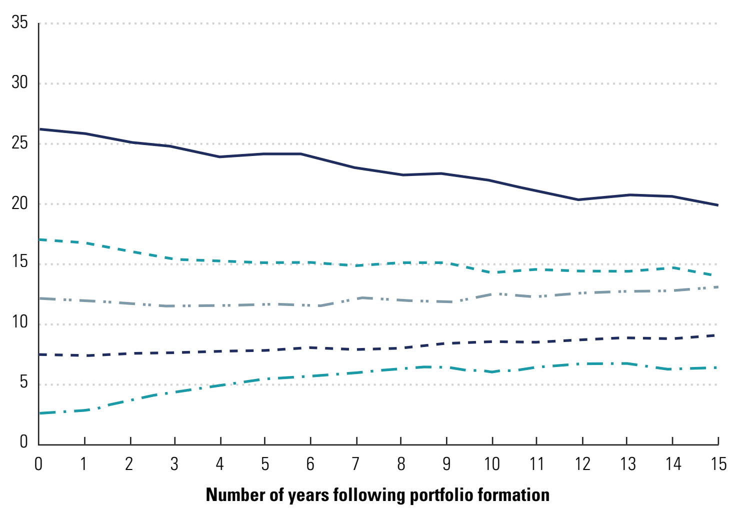
and companies earning low returns tended to see them rise over time. Only in the portfolio containing companies generating returns between 5 and 10 percent (mostly regulated companies) do rates of return remain constant. However, an important phenomenon is the persistence of superior performance beyond 10 years. The ROICs of the best-performing companies do *not* revert all the way back to the aggregate median over 15 years. High-performing companies are in general remarkably capable of sustaining a competitive advantage in their businesses and/or finding new business where they continue or rebuild such advantages.

Since a company's continuing value is highly dependent on long-run forecasts of ROIC and growth, this result has important implications for corporate valuation. Basing a continuing value on the economic concept that ROIC will approach the weighted average cost of capital (WACC) is overly conservative for the *typical* company generating high ROICs. (Continuing value is the focus of Chapter 12.)

When we benchmark the historical decay of company ROICs, it is important to segment results by industry (especially if industry is a proxy for sustainability of competitive advantage). In Exhibit 6.9, we plot the ROIC decay rates for consumer staples. As the exhibit demonstrates, the top-performing companies don't show much reversion to the mean. Even after 15 years, the *original* class of best performers still outperforms the worst performers by more than 13 percentage points.

EXHIBIT 6.9 **ROIC Decay Analysis: Consumer Staples**

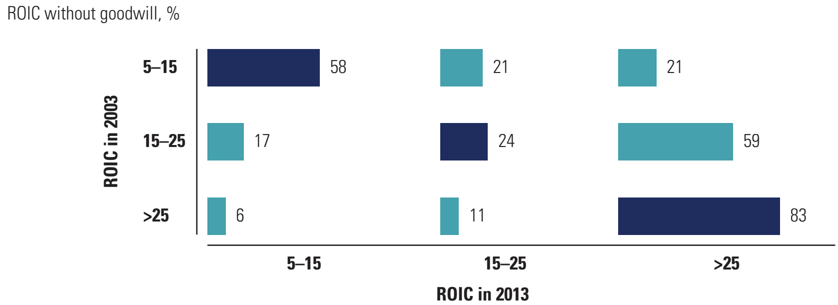
Median ROIC of portfolios (without goodwill),[1] by quintile, %



[1] At year 0, companies are grouped into one of five portfolios, based on ROIC.

Source: Compustat, McKinsey Corporate Performance Analysis Tool.

EXHIBIT 6.10 **ROIC Transition Probability**



Although decay rates examine the *rate* of regression toward the mean, they present only aggregate results and tell us nothing about the spread of potential future performance. Does every company generating returns greater than 20 percent eventually migrate to 15 percent, or do some companies actually go on to generate higher returns? Conversely, do some top performers become poor performers? To address this question, we measured the probability that a company will migrate from one ROIC grouping to another in 10 years. The results are presented in Exhibit 6.10. Read each row from left to right. A company whose ROIC was 5 to 15 percent in 2003 had a 58 percent chance of earning 5 to 15 percent in 2013.

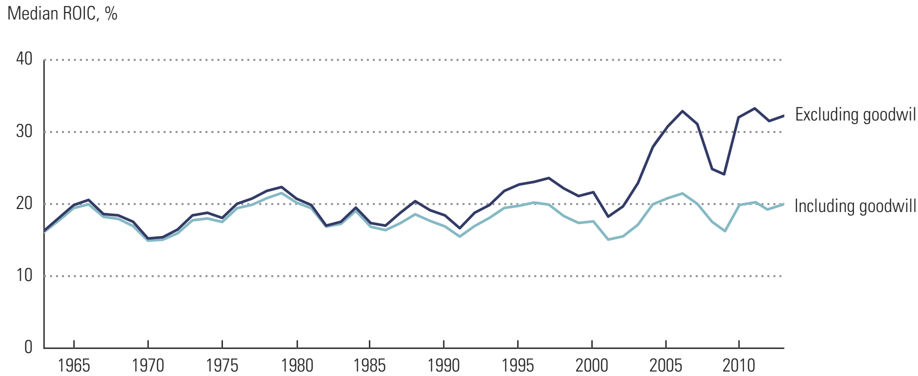
Both high and low performers demonstrate significant stability in their performance. Companies with high or low ROICs are most likely to stay in the same grouping (a 58 percent probability for those with ROIC of 5 to 15 percent, and an 83 percent probability for those with ROIC above 25 percent). Among companies whose ROIC was between 15 and 25 percent, there was a tendency for companies to increase their ROIC 10 years later.

You will see that overall there is an upward drift, which is consistent with the increasing median ROIC we saw earlier, as well as the increase in ROIC in some sectors. When we conducted these analyses for prior editions of this book, the upward drift was not so evident. It's not clear whether that drift is sustainable.

Effect of Acquisitions on ROIC

While returns on invested capital without goodwill have been increasing, returns on invested capital with goodwill have been flat, as shown in Exhibit 6.11. This suggests that acquiring companies haven't been able to extract much value from their acquisitions. This is not to say they haven't improved the performance of the acquired businesses; indeed, a closer look reveals significant realized synergies driving up returns on capital without goodwill. However,

EXHIBIT 6.11 **ROIC with and without Goodwill, 1963–2013**



Source: McKinsey Corporate Performance Analysis Tool.

these companies paid high prices for their acquisitions, so most of the value the deals created was transferred to the shareholders of the target company. (We discuss acquisitions and value creation in Chapter 27.)

SUMMARY

There are many lessons to learn about returns on invested capital. First, these returns are driven by competitive advantages that enable companies to realize price premiums, cost and capital efficiencies, or some combination of these. Second, industry structure is an important but not an exclusive determinant of ROIC. Certain industries are more likely to earn either high, medium, or low returns, but there is still significant variation in the rates of return for individual companies within each industry. Third, and most important, if a company finds a formula or strategy that earns an attractive ROIC, there is a good chance it can sustain that attractive return over time and through changing economic, industry, and company conditions—especially in the case of industries that enjoy relatively long product life cycles. Unfortunately, the converse is also true: if a company earns a low ROIC, that is likely to persist as well.

7

Growth

Growth and its pursuit grip the business world. The popular view is that a company must grow to survive and prosper. There is certainly some truth to this. Slow-growing companies present fewer interesting opportunities for managers and so may have difficulty attracting and retaining talent. They are also much more likely to be acquired than faster-growing firms: over the past 20 years, most of the 225 companies that have disappeared from the S&P 500 index were acquired by larger companies or went private.

However, as we discussed in Chapter 2, growth creates value only when a company's new customers, projects, or acquisitions generate returns on invested capital (ROICs) greater than its cost of capital. And as companies grow larger and their industries become ever more competitive, finding good, high-value-creating projects becomes increasingly difficult. Striking the right balance between growth and return on invested capital is critically important to value creation. Our research shows that for companies with a high ROIC, shareholder returns are affected more by an increase in revenues than an increase in ROIC.[1] Indeed, we have found that if such companies let their ROIC drop a bit (though not too much) to achieve higher growth, their returns to shareholders are higher than for companies that maintain or improve their high ROIC but grow more slowly. Conversely, for companies with a low ROIC, increasing it will create more value than growing the company will.

In the previous chapter, we explored why executives need to understand whether their strategies will lead to high returns on invested capital. Similarly, they also need to know which growth opportunities will create the most value. In this chapter, we discuss the principal strategies for driving revenue growth, the ways in which growth creates value, and the challenges of sustaining growth. We end by analyzing the data on corporate growth patterns over the past 50 years.

[1]See T. Koller and B. Jiang, "How to Choose between Growth and ROIC," *McKinsey on Finance*, no. 25 (Autumn 2007): 19–22.

DRIVERS OF REVENUE GROWTH

When executives plan for growth, a good starting point is for them to disaggregate revenue growth into its three main components:[2]

1. *Portfolio momentum:* This is the organic revenue growth a company enjoys because of overall expansion in the market segments represented in its portfolio.
2. *Market share performance:* This is the organic revenue growth (or reduction) a company earns by gaining or losing share in any particular market.
3. *Mergers and acquisitions (M&A):* This represents the inorganic growth a company achieves when it buys or sells revenues through acquisitions or divestments.

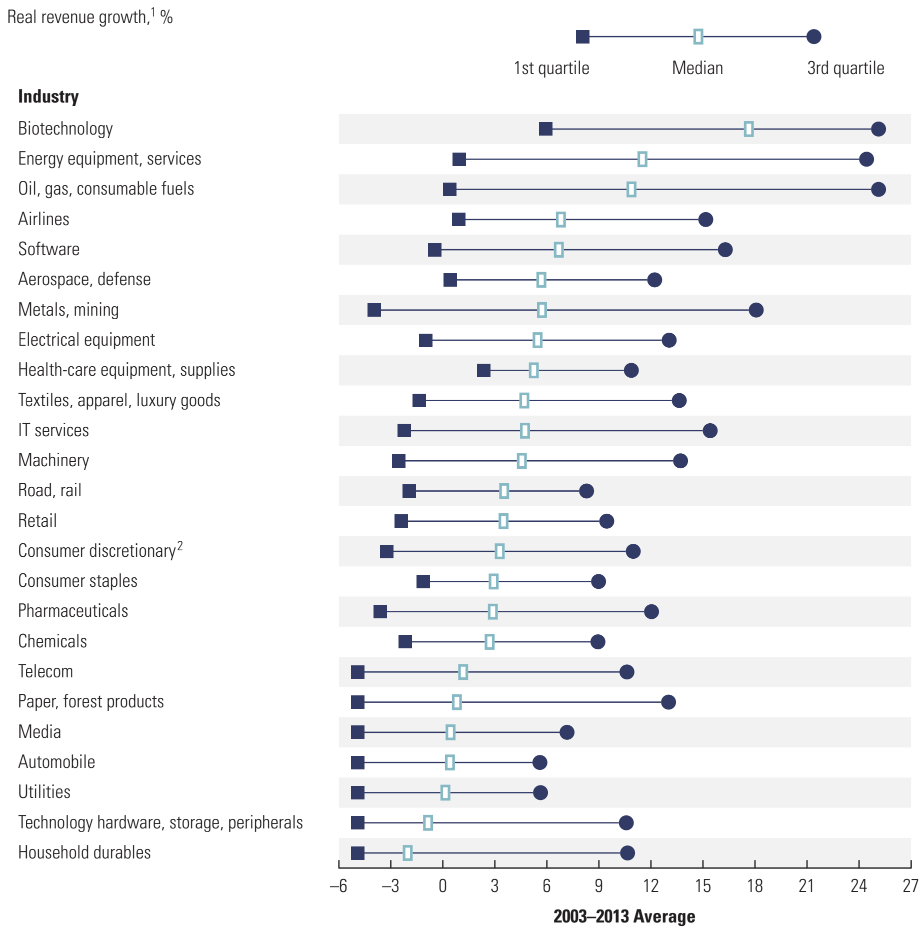
Baghai, Smit, and Viguerie showed that for large companies, the most important source of growth by far was portfolio momentum. In other words, being in fast-growing markets was the largest driver of growth. Least important was market share growth. Yet we find that managers tend to focus most of their attention on gaining share in their existing product markets. While it's necessary to maintain and sometimes increase market share, changing a company's exposure to growing and shrinking market segments should be a major focus.[3]

To see the effect of portfolio momentum, consider how the median growth from 2003 to 2013 differs by industry (Exhibit 7.1). Not surprisingly, the fastest-growing sector over this period was biotechnology, a small industry characterized by tremendous innovation. Makers of traditional pharmaceuticals, by contrast, were in the bottom third of industry growth, as many of their highest-selling drugs came off patent. The oil and gas sector stood near the top of the list, primarily because of oil price increases rather than volume growth. At the time of this writing in late 2014, oil prices had just dropped by more than 20 percent, which means that the sector's growth may turn negative if lower prices prevail. The technology hardware sector was another surprise, coming in second to last. Despite tremendous increases in volume, lower prices have kept total revenue growth close to zero.

Exhibit 7.1 also shows widely varied growth within industries. If a company's growth depends mainly on the dynamics of the sector markets in which it operates, why should there be such big differences in growth among different companies operating in the same sector? The most important reason is that

[2]This section draws on P. Viguerie, S. Smit, and M. Baghai, *The Granularity of Growth* (Hoboken, NJ: John Wiley & Sons, 2008).
[3]M. Baghai, S. Smit, and P. Viguerie, "The Granularity of Growth," *McKinsey on Finance*, no. 24 (Summer 2007): 25–30.

EXHIBIT 7.1 **Variation in Revenue Growth by Industry**



[1] Growth figures have been capped at –5% and 25% for charting purposes.
[2] Hotels, restaurants, and leisure.

Source: Compustat, McKinsey Corporate Performance Analysis Tool.

the average growth rate of companies competing in any sector masks big differences in growth across the sector's market segments and subsegments.

To understand markets in this fine-grained way and the differences in companies' revenue growth, Baghai, Smit, and Viguerie analyzed market growth at the level of individual product and geographical segments with around \$50 million to \$200 million in sales, rather than at the company, divisional, or business unit level.[4] Their example of a large European manufacturer of personal-care products shows why such analysis is revealing. The company

[4] See M. Baghai, S. Smit, and P. Viguerie, "Is Your Growth Strategy Flying Blind?" *Harvard Business Review* (May 2009): 86–96.

has three divisions with apparently low prospective growth rates ranging from 1.6 percent to 7.5 percent a year. However, the range of forecast growth rates for individual product lines within the divisions is much wider. For instance, the division with the lowest expected growth rate has one product line growing at 24 percent, one of the company's best growth opportunities. At the same time, the division with the highest growth rate has several product lines that are shrinking fast and may warrant divestment.

GROWTH AND VALUE CREATION

While managers typically strive for high growth, the highest growth will not necessarily create the most value. The reason is that the three drivers of growth (portfolio momentum, acquisitions, and market share gains) do not all create value in equal measure. To understand why not, consider who loses under alternative scenarios for revenue growth and how effectively losers can retaliate.

Increases in market share that come at the expense of established competitors rarely create much value for long, unless they push smaller competitors out of the market entirely. The reason is that established competitors can easily retaliate. Growth driven by price increases comes at the expense of customers, who can retaliate by reducing consumption and seeking substitute products. So new value created by price increases may not last long. Growth driven by general market expansion comes at the expense of companies in other industries, which may not even know to whom they are losing share. This category of loser is the least able to retaliate, which makes product market growth the driver likely to create the most value. The value of growth from acquisitions is harder to characterize, because it depends so much on the price of the acquisition (as discussed in Chapter 27).

It is possible to rank different growth tactics that fall within the three overall growth strategies according to their potential for creating value (see Exhibit 7.2). This ranking may not be exactly the same for all industries, but it works well as a starting point. The tactics with the highest potential to create value are all variations on entering fast-growing product markets that take revenues from distant companies, rather than from direct competitors or customers.

Developing *new products* or services that are so innovative as to create entirely new product categories has the highest value-creating potential. The stronger the competitive advantage a company can establish in the new-product category, the higher will be its ROIC and the value created, as we discussed in the previous chapter. For example, the coronary stent commercialized in the early 1990s reduced the need for heart surgery, lowering both the risk and cost of treating cardiac problems. Owing to this innovation's overwhelming competitive advantage over traditional treatments, as well as over

EXHIBIT 7.2 **Value of Major Types of Growth**

Value created[1]	Type of growth	Rationale
Above average	• Create new markets through new products	• No established competitors; diverts customer spending
	• Convince existing customers to buy more of a product	• All competitors benefit; low risk of retaliation
	• Attract new customers to the market	• All competitors benefit; low risk of retaliation
Average	• Gain market share in fast-growing market	• Competitors can still grow despite losing share; moderate risk of retaliation
	• Make bolt-on acquisitions to accelerate product growth	• Modest acquisition premium relative to upside potential
Below average	• Gain share from rivals through incremental innovation	• Competitors can replicate and take back customers
	• Gain share from rivals through product promotion and pricing	• Competitors can retaliate quickly
	• Make large acquisitions	• High premium to pay; most value diverted to selling shareholders

[1] Per dollar of revenue.

subsequent products entering the market,[5] neither type of competitor could retaliate, so the innovators created large amounts of value. (In recent years, however, returns have declined as the stent market has become more competitive.)

Similarly, traditional television has been unable to compete with the interactivity of the Internet and video games, as consumers have taken up these media for their home entertainment. However, competition in the new digital-entertainment category is itself fierce, so the value created per dollar of revenue in this sector is unlikely to reach the levels generated by the coronary stent.

Next in the pecking order of value-creating growth tactics comes *persuading existing customers to buy more* of a product or related products. For example, if Procter & Gamble convinces customers to wash their hands more frequently, the market for hand soap will grow faster. Direct competitors will not retaliate, because they benefit as well. The ROIC associated with the additional revenue is likely to be high because the companies' manufacturing and distribution systems can typically produce the additional products at little additional cost. Clearly, the benefit will not be as large if the company has to increase costs substantially to secure those sales. For example, offering bank customers insurance products requires the expense of an entirely new sales force, because the products are too complex to add to the list of products the bankers are already selling.

[5] Products that entered the market at a later stage were less successful because of high switching costs for customers (see Chapter 6).

Attracting new customers to a market also can create substantial value. Consumer packaged-goods companies Beiersdorf and L'Oréal accelerated growth in sales of skin-care products by convincing men to use their Nivea and Biotherm products, respectively. Once again, competitors didn't retaliate because they also gained from the category expansion. Men's skin-care products aren't much different from women's, so much of the research and development (R&D), manufacturing, and distribution cost could be shared. The major incremental cost was for marketing and advertising.

The value a company can create from increasing market share depends on both the market's rate of growth and the way the company goes about gaining share. There are three main ways to grow market share (although they don't fall next to each other in the pecking order of types of growth). When a company *gains market share in a fast-growing market*, the absolute revenues of its competitors may still be growing strongly, too, so the competitors may not retaliate. However, gaining share in a mature market is more likely to provoke retaliation by competitors.

Gaining share from *incremental innovation*—for example, through incremental technology improvements that neither fundamentally change a product nor create an entirely new category and are possible to copy—won't create much value or maintain the advantage for long. From a customer's viewpoint, hybrid and electric vehicles aren't fundamentally different from gas or diesel vehicles, so they cannot command much of a price premium to offset their higher costs. The total number of vehicles sold will not increase, and if one company gains market share for a while, competitors will try to take it back, as competitors can quickly copy each other's innovations. All in all, auto companies aren't likely to create much value from hybrid or electric vehicles; competition will likely transfer all the benefits to consumers.

Gaining share through *product pricing and promotion* in a mature market rarely creates much value, if any. Huggies and Pampers dominate the disposable-diaper market, are financially strong, and can easily retaliate if the other tries to gain share, so any growth arising from, say, an intense advertising campaign that hits directly at the other competitor will provoke retaliation. And as Amazon continued expanding into the U.S. consumer electronics retail market in 2009, Wal-Mart retaliated with price cuts on key products such as top-selling video games and game consoles, even though Amazon's $20 billion in sales in 2008 were a fraction of Wal-Mart's $406 billion sales in the same year.

In concentrated markets, share battles often lead to a cycle of market share give-and-take, but rarely a permanent share gain for any one competitor, unless that competitor changes the product or its delivery enough to create what is effectively a new product. The possible exception is when stronger companies gain share from smaller, weaker competitors and force the weaker players out of the market entirely.

Price increases, over and above cost increases, can create value as long as any resulting decline in sales is small. However, they tend not to be repeatable: if a company or several competitors get away with a price increase one year, they are unlikely to have the same good fortune the next. Furthermore, the first increase could be eroded fairly quickly. Otherwise, you would see some companies increasing their profit margins year after year, while in reality, long-term increases in profit margins are rare. There was an exception among packaged-goods companies in the mid-1990s. They passed on increases in commodity costs to customers but did not lower prices when their commodity costs subsequently declined. But even they haven't been able to do the same thing since.

There are two main approaches to growing through acquisitions. Growth through *bolt-on acquisitions* can create value if the premium paid for the target is not too high. Bolt-on acquisitions make incremental changes to a business model—for example, by completing or extending a company's product offering or filling gaps in its distribution system. IBM has been very successful in bolting on smaller software companies and subsequently marketing their applications through its existing global sales and distribution system, which can absorb the additional sales without too much extra investment. Because such acquisitions are relatively small, they boost IBM's growth but add little cost and complexity.

In contrast, creating growth through *large acquisitions*—say, one-third the size or more of the acquiring company—tends to create less value. Large acquisitions typically occur when a market has begun to mature and the industry has excess capacity. While the acquiring company shows revenue growth, the combined revenues often do not increase, and sometimes they decrease because customers prefer to have multiple suppliers. Any new value comes primarily from cost cutting, not from growth. Furthermore, integrating the two companies requires significant investments and involves far more complexity and risk than integrating small, bolt-on acquisitions.

The logic explaining why growth from product market growth creates greater and more sustainable value than taking share is compelling. Nevertheless, the dividing line between the two types of growth can be fuzzy. For instance, some innovations prevent existing competitors from retaliating, even though the innovator's products and services may not appear to be that new. Wal-Mart's innovative approach to retailing in the 1960s and 1970s offered an entirely new shopping experience to its customers, who flocked to the company's stores. One could argue that Wal-Mart was merely taking share away from small local stores. But the fact that its competitors could not retaliate suggests that Wal-Mart's approach constituted a truly innovative product. However, if Wal-Mart were to grow by winning customers from Target, that would count as market share gain, because Target and Wal-Mart offer their retailing product in a similar fashion.

Since underlying product market growth tends to create the most value, companies should aim to be in the fastest-growing product markets so they can achieve growth that consistently creates value. If a company is in the wrong markets and can't easily get into the right ones, it may do better by sustaining growth at the same level as its competitors while finding ways to improve and sustain its ROIC.

WHY SUSTAINING GROWTH IS HARD

Sustaining high growth is much more difficult than sustaining ROIC, especially for larger companies. The math is simple. Suppose your core product markets are growing at the rate of the gross domestic product (GDP)—say, 5 percent nominal growth—and you currently have $10 billion in revenues. Ten years from now, assuming you grow at 5 percent a year, your revenues will be $16.3 billion. Assume you aspire to grow organically at 8 percent a year. In 10 years, your revenues will need to be $21.6 billion. Therefore, you will need to find new sources of revenues that can grow to more than $5.3 billion per year by the 10th year. Adjusting for inflation of 2 percent, you need an extra $4.3 billion per year in today's dollars. Another way to think of it is that you would need to reinvent a Fortune 500 company to find such revenues.[6] If your product markets are growing at only 5 percent, how can you possibly achieve that magnitude of growth?

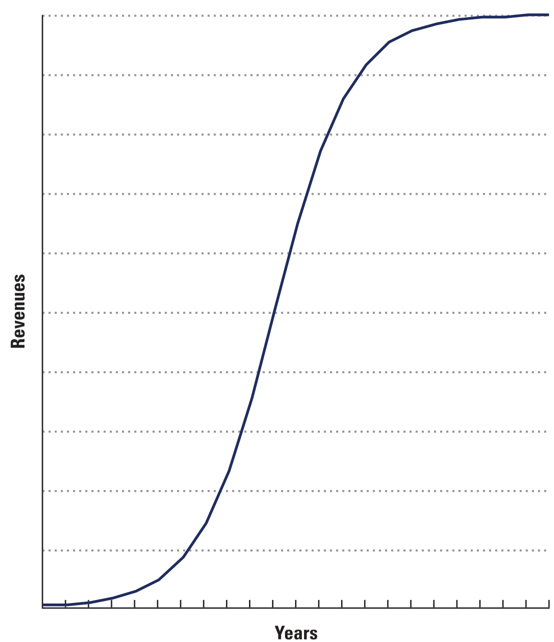
Given this difficulty, the growth targets that some companies embrace are simply unrealistic. We know of one with sales already in excess of $5 billion who announced growth targets of more than 20 percent a year for the next 20 years. Since annual world economic growth is typically less than 4 percent in real terms, and many companies are competing for a share of that growth, company growth targets need to be more pragmatic.

Sustaining growth is difficult because most product markets have natural life cycles. The market for a product—which means the market for a narrow product category sold to a specific customer segment in a specific geography—typically follows an S-curve over its life cycle until maturity, as shown on the left side of Exhibit 7.3. The right side shows the growth curves for various real products, scaled to their relative penetration of U.S. households. First, a product has to prove itself with early adopters. Growth then accelerates as more people want to buy the product, until it reaches its point of maximum penetration. After this point of maturity, and depending on the nature of the product, either sales growth falls back to the same rate of growth as the population or the economy, or sales may start to shrink. To illustrate, autos and packaged snacks have continued to grow in line with economic growth for half a century or more, while videocassette recorders (VCRs) lasted less than 20 years before they started to decline, and then disappeared.

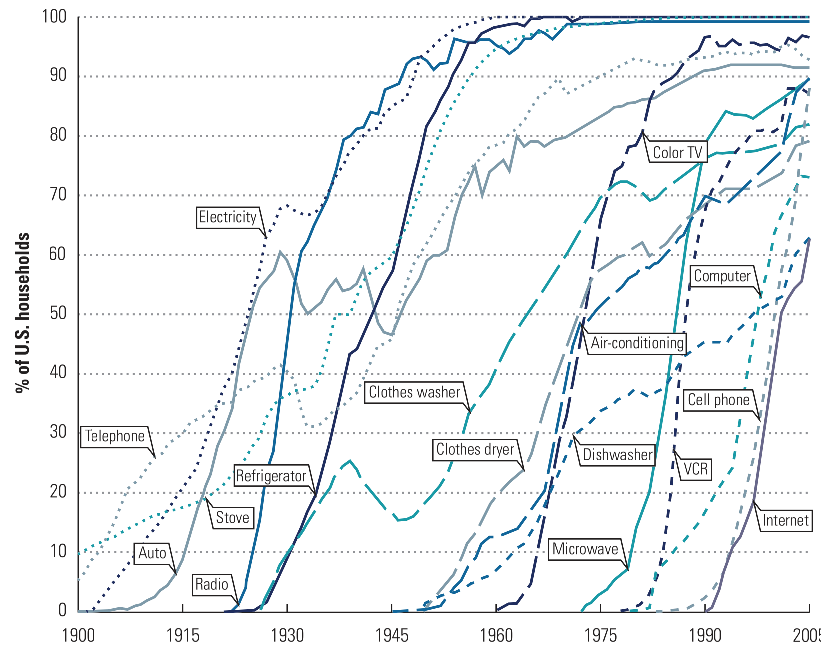
[6] The cutoff point for the Fortune 500 in terms of revenues was around $4 billion in 2013.

EXHIBIT 7.3 **Variation in Growth over Product Life Cycle**

Generic product life cycle

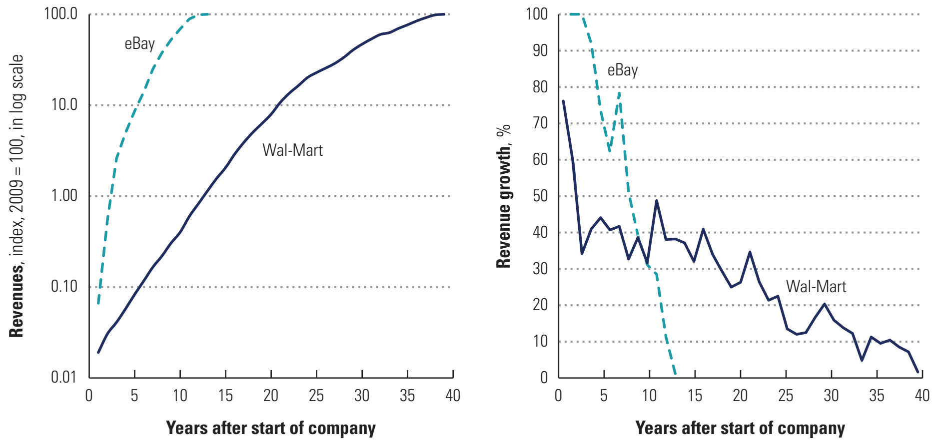


Life cycle for selected products



Source: W. Cox and R. Alm, "You Are What You Spend," *New York Times*, February 10, 2008.

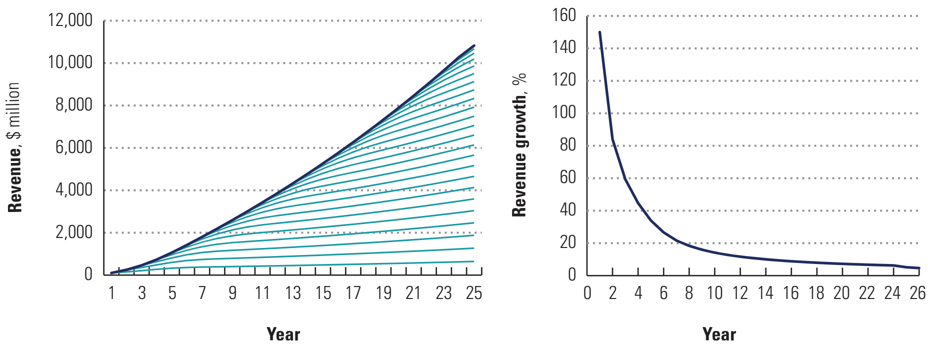
EXHIBIT 7.4 **Wal-Mart and eBay: Growth Trajectories**



While the pattern of growth is usually the same for every product and service, the amount and pace of growth will vary for each one. Exhibit 7.4 compares Wal-Mart and eBay. Wal-Mart's growth did not dip below 10 percent until the end of the 1990s, some 35 years after it was founded. In contrast, eBay saw its growth fall to below 10 percent after only 12 years, having grown very rapidly to reach maturity early. Because eBay is an Internet-based auction house, it doesn't need to add many more staff members in order to grow. In contrast, Wal-Mart, as a physical retailer, has to add people as quickly as it adds stores and sales. The speed at which Wal-Mart can hire and train people limits its rate of growth relative to eBay. But Wal-Mart's core market is much larger than eBay's. In 2013, Wal-Mart generated $473 billion of revenues, mostly from its core discount and supercenter stores, whereas eBay generated only about $16 billion of revenues because its core addressable market is so much smaller.

Sustaining high growth presents major challenges to companies. Given the natural life cycle of products, the only way to achieve consistently high growth is to consistently find new product markets and enter them successfully in time to enjoy their more profitable high-growth phase. Exhibit 7.5 illustrates this by showing the cumulative sales for a company that introduces one new product in one market (geographic or customer segment) in each year. All products are identical in terms of sales volume and growth; their growth rates are very high in the beginning and eventually slow to 3 percent once the market is fully penetrated. Although the company continues to launch new products that are just as successful as their predecessors, aggregate sales growth slows down rapidly as the company gets bigger. In the long term, growth approaches 3 percent, equal to the long-term growth rate of the markets for the company's products. Ultimately, a company's growth and size are constrained by the growth and size of its product markets and the number of product markets in which it competes.

EXHIBIT 7.5 **The Challenge of Sustaining High Growth**



To sustain high growth, companies need to overcome this "portfolio treadmill" effect: for each product that matures and declines in revenues, the company needs to find a similar-sized replacement product to stay level in revenues—and even more to continue growing. Think of the pharmaceutical industry, which showed unprecedented growth from the mid-1990s, thanks to so-called blockbuster drugs such as Lipitor and Celebrex. Then growth plummeted as these drugs came off patent and the next generation of drugs didn't deliver the same outsized sales as the blockbusters. Finding sizable new sources of growth requires more experimentation and a longer time horizon than many companies are willing to invest in. In another industry, General Electric's GE Capital business was a side business in 1981, when it generated about 8 percent of GE's profits. Only after 26 years of consistent investment did it reach 50 percent of GE's profits in 2005.

EMPIRICAL ANALYSIS OF CORPORATE GROWTH

The empirical research backs up the previously described principles. This section presents our findings on the level and persistence of corporate growth for U.S.-based nonfinancial companies with revenues greater than $1 billion (inflation-adjusted) from 1963 to 2013. (The sample size for each year is different, but amounts to about 1,200 companies in 2013.) The analysis of their revenue growth follows the same procedure as the analysis of ROIC data in Chapter 6, except here we use three-year rolling averages to moderate distortions caused by currency fluctuations and M&A activity. We also use real, rather than nominal, data to analyze all corporate growth results, because even mature companies saw a dramatic increase in revenues during the 1970s as inflation increased prices. (Ideally, we would report statistics on *organic* revenue growth, but current reporting standards do not require companies to disclose the effects of currencies and M&A on their revenues.) The overall findings concerning revenue growth are as follows:

- The median rate of revenue growth between 1965 and 2013 was 5.3 percent in real terms. Real revenue growth fluctuated significantly, ranging from 0 percent to 9 percent, with significant cyclicality.
- High growth rates decayed very quickly. Companies growing faster than 20 percent (in real terms) typically grew at only 8 percent within five years and at 5 percent within 10 years.

Growth Trends

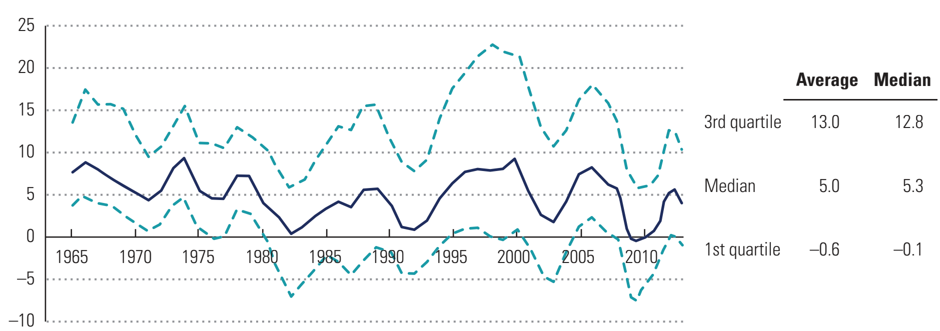
Let's begin by examining aggregate levels and trends of corporate growth. Exhibit 7.6 presents median (real) revenue growth rates between 1965 and 2013. The average median revenue growth rate for that period equals 5.3 percent per year and oscillates between roughly 0 percent and 9 percent. Median revenue growth demonstrates no trend over time.

Real revenue growth of 5.3 percent is quite high when compared with real GDP growth in the United States (2.9 percent). Why the difference? Possible explanations abound. The first is self-selection: companies with good growth opportunities need capital to grow. Since public markets are large and liquid, high-growth companies are more likely to be publicly traded than privately held ones. We measure only publicly traded companies, so these growth results are likely to be higher.

Second, as companies become increasingly specialized and outsource more services, firms providing services will grow and develop quickly without

EXHIBIT 7.6 **Long-Term Revenue Growth for Nonfinancial Companies, 1965–2013**

3-year revenue growth rate,[1] adjusted for inflation, %



[1] Compound annual growth rate.

Source: Compustat, McKinsey Corporate Performance Analysis Tool.

affecting the GDP figures. Consider Jabil Circuit, a contract electronics manufacturer. When a company like Apple or IBM has Jabil manufacture products or components on its behalf, GDP, which measures aggregate output, will not change. Yet Jabil's growth will influence our sample.

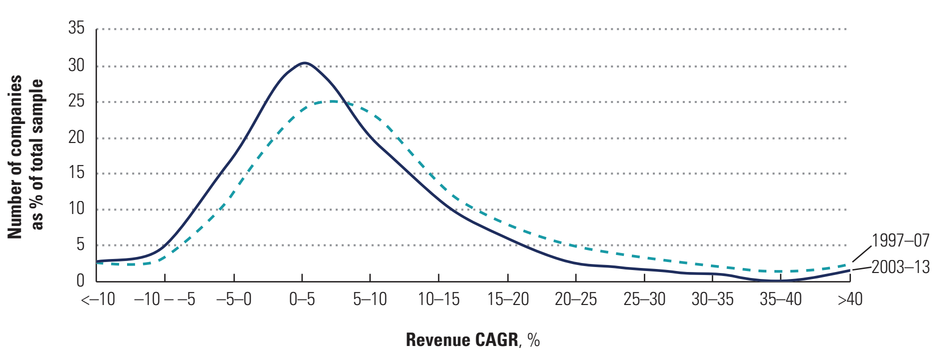
A third explanation is global expansion. Many of the companies in the sample create products and generate revenue outside the United States, which again will not affect U.S. GDP. Next, we focus on median measures. A significant portion of U.S. GDP is driven by large companies, which tend to grow more slowly. But we measure the median corporate growth rates; the median company is typically small, and small public companies grow faster. Finally, although we use rolling averages and medians, these cannot eliminate but only dampen the effects of M&A and currency fluctuations, which do not reflect organic growth.

In addition to mapping median growth, Exhibit 7.6 also reveals that from the mid-1970s to 2013, at least one-quarter of all companies shrank in real terms almost every year. Thus, although most companies publicly project healthy growth over the next five years, in reality many mature firms will shrink. This underlines the need to exercise caution before projecting strong growth for a valuation, especially in mature sectors.

Exhibit 7.7 shows the distribution of real revenue growth for two periods, 1997–2007 (before the Great Recession), and 2003–2013. Not surprisingly, the distribution was somewhat lower in the latter period. From 2003 to 2013, about 55 percent of companies in the sample grew at an annual real rate of less than 5 percent. Only 25 percent grew faster than 10 percent. (This includes the effect of acquisitions, so fewer companies grew faster than 10 percent just through organic growth.)

EXHIBIT 7.7 **Distribution of Growth Rates**

Inflation-adjusted revenue growth rate[1]



[1] Compound annual growth rate.

Source: Compustat, McKinsey Corporate Performance Analysis Tool.

Growth across Industries

As shown in Exhibit 7.1, growth rates varied across industries from 2003 to 2013. Unlike ROICs, where the industry ranking tends to be stable, the industry growth ranking varies significantly, as shown in Exhibit 7.8. Some of the variation is explained by structural factors, such as the saturation of markets (the declining growth in hotels and restaurants and in chemicals) or efficiency improvements that lead the economy to reduce use of a product (electric utilities). In other cases, growth is more cyclical. Growth in energy equipment varied from decade to decade as new ways to extract oil and gas were developed, opening up new fields that were previously uneconomic. The telecommunications sector enjoyed a burst of growth in the 2000s as mobile phones became ubiquitous.

In spite of this high degree of variation, some sectors have consistently been among the fastest growing. These include software, IT services, and healthcare equipment, where demand has remained strong for four decades. Others, such as automobiles and consumer staples, have consistently registered lower growth rates, as their markets had already reached maturity in the 1970s.

Sustaining Growth

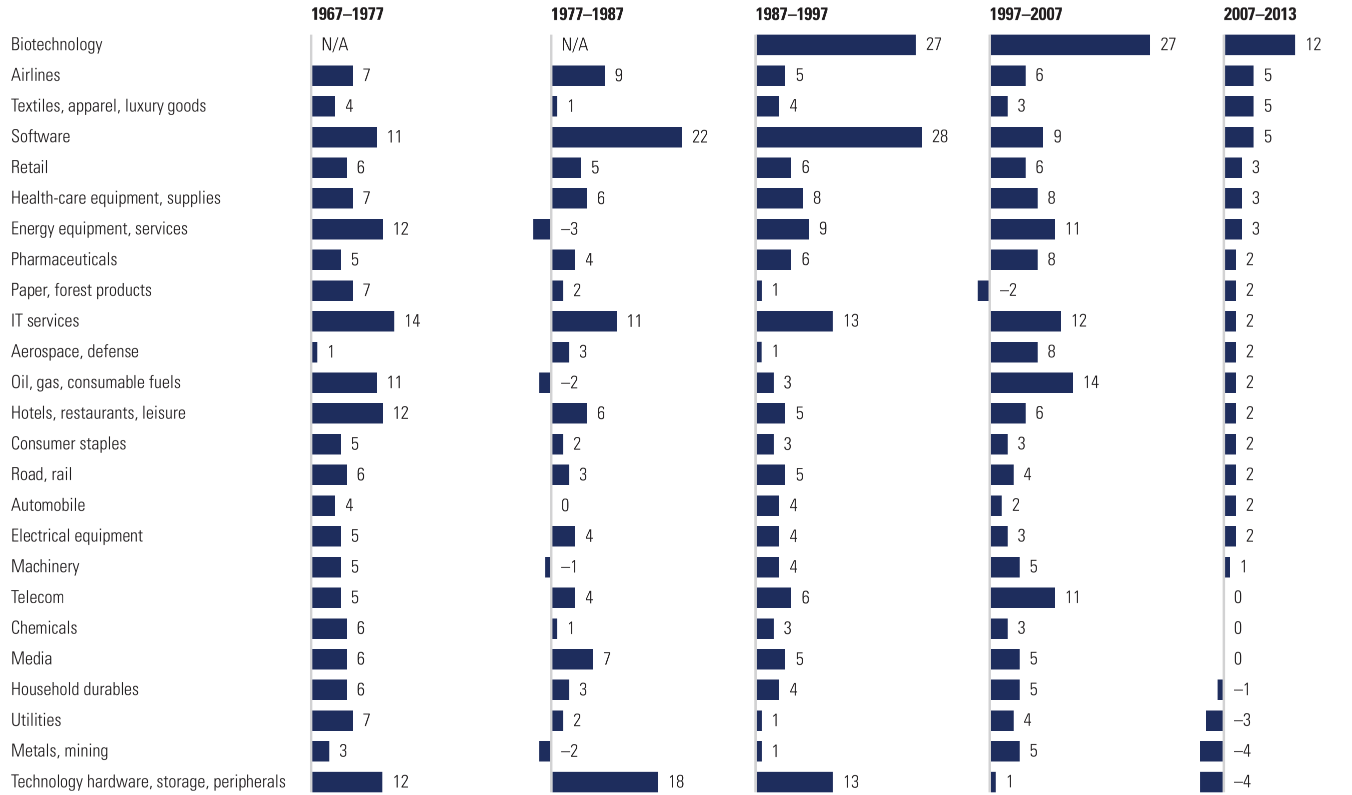
Understanding a company's potential for growing revenues in the future is critical to valuation and strategy assessment. Yet developing reasonable projections is a challenge, especially given the upward bias in growth expectations demonstrated by research analysts and the media. Research shows that analyst forecasts of one-year-out aggregate earnings growth for the S&P 500 are systematically overoptimistic, exceeding actual earnings growth by five percentage points or more.[7]

To put long-term corporate growth rates in their proper perspective, we present historical rates of growth decay. Companies were segmented into five portfolios, depending on their growth rate in the year the portfolio was formed. Exhibit 7.9 plots how each portfolio's median company grows over time. As the exhibit shows, growth decays very quickly; high growth is not sustainable for the typical company. Within three years, the difference across portfolios narrows considerably, and by year 5, the highest-growth portfolio outperforms the lowest-growth portfolio by less than five percentage points. Within 10 years, this difference drops to less than two percentage points. Comparing the decay of growth to that of ROIC shown in the previous chapter, we see that although companies' rates of ROIC generally remain fairly stable over time—top companies still outperform bottom companies by more than 10 percentage points after 15 years—rates of growth do not.

[7]See, for example, M. Goedhart, B. Raj, and A. Saxena, "Equity Analysts: Still Too Bullish," *McKinsey on Finance*, no. 35 (Spring 2010): 14–17.

EXHIBIT 7.8 **Volatile Growth by Industry**

Industry median 10-year revenue CAGR, adjusted for inflation, %



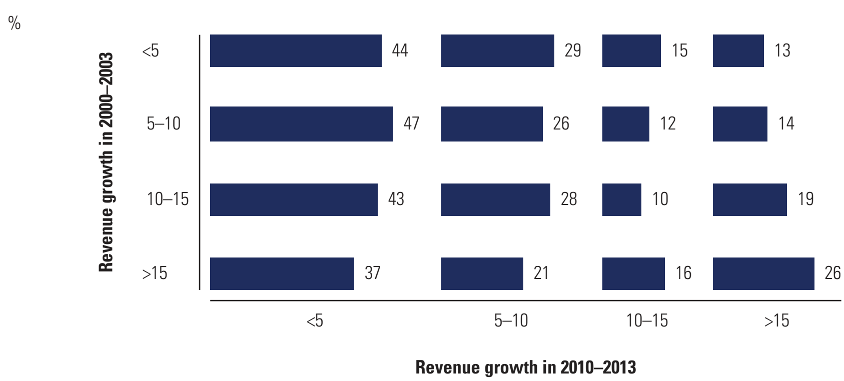
Source: Compustat, McKinsey Corporate Performance Analysis Tool.

EXHIBIT 7.9 **Revenue Growth Decay Analysis**

[1] At year 0, companies are grouped into one of five portfolios, based on revenue growth.
Source: Compustat, McKinsey Corporate Performance Analysis Tool.

As discussed earlier in this chapter, companies struggle to maintain high growth because product life cycles are finite and growth gets more difficult as companies get bigger. Do any companies counter this norm? The short answer: very few. Exhibit 7.10 allocates companies to groupings by their growth rates and shows the probability of a company moving between the groupings over time. Clearly, maintaining high growth is uncommon. Of the companies reporting less than 5 percent revenue growth from 2000 to 2003, 44 percent

EXHIBIT 7.10 **Revenue Growth Transition Probability**



continued to report growth below 5 percent 10 years later. High-growth companies don't fare much better: of the companies growing faster than 15 percent from 2000 to 2003, 37 percent grew at real rates below 5 percent 10 years later. Only 26 percent of high-growth companies maintained better than 15 percent real growth 10 years later, some of which was driven by the recovery from the recession, as well as by increasing commodity prices and acquisitions. High growth is very difficult to sustain—much more difficult than high ROIC.

SUMMARY

To maximize value for their shareholders, companies should understand what drives growth and what makes it value-creating. Long-term revenue growth for large companies is largely driven by the growth of the markets in which they operate. Although gains in market share contribute to revenues in the short term, these are far less important for long-term growth.

Revenue growth is not all that matters for creating value; the value created per dollar of additional revenues is the crucial point. In general, this depends on how easily competitors can respond to a company's growth strategy. The growth strategy with the highest potential in this respect is true product innovation, because entirely new product categories by definition have no established competition. Attracting new customers to an existing product or persuading existing customers to buy more of it also can create substantial value, because direct competitors in the same market tend to benefit as well. Growth through bolt-on acquisitions can add value, because such acquisitions can boost revenue growth at little additional cost and complexity. Typically, much less attractive is revenue growth from market share gains, because it comes at the expense of established, direct competitors, who are likely to retaliate, especially in maturing markets.

Sustaining high growth is no less a challenge than initiating it. Because most products have natural life cycles, the only way to achieve lasting high growth is to continue introducing new products at an increasing rate—which is nearly impossible. Not surprisingly, growth rates for large companies decay much faster than do returns on invested capital; growth rates for even the fastest-growing companies tend to fall back to below 5 percent within 10 years.

Part Two

Core Valuation Techniques

8

Frameworks for Valuation

In Part One, we built a conceptual framework to show what drives the creation of value. A company's value stems from its ability to earn a healthy return on invested capital (ROIC) and its ability to grow. Healthy rates of return and growth produce high cash flows, the ultimate source of value.

Part Two offers a step-by-step guide for analyzing and valuing a company in practice, including technical details for properly measuring and interpreting the drivers of value. Among the many ways to value a company (see Exhibit 8.1 for an overview), we focus particularly on two: enterprise discounted cash flow (DCF) and discounted economic profit. When applied correctly, both valuation methods yield the same results; however, each model has certain benefits in practice. Enterprise DCF remains a favorite of practitioners and academics because it relies solely on the flow of cash in and out of the company, rather than on accounting-based earnings. The discounted economic-profit valuation model can be quite insightful because of its close link to economic theory and competitive strategy. Economic profit highlights whether a company is earning its cost of capital and quantifies the amount of value created each year. Given that the two methods yield identical results and have different but complementary benefits, we recommend creating *both* enterprise DCF and economic-profit models when valuing a company.

Both the enterprise DCF and economic-profit models discount future cash flow streams at the weighted average cost of capital (WACC). WACC-based models work best when a company maintains a relatively stable debt-to-value ratio. If a company's debt-to-value ratio is expected to change, WACC-based models can still yield accurate results but are more difficult to apply. In such cases, we recommend an alternative to WACC-based models: adjusted present value (APV). APV discounts the same cash flows as the enterprise DCF model, but uses the unlevered cost of equity as the discount rate (without the tax benefit of debt). It then separately values the cash flow tax benefits of debt and adds them to determine the total enterprise value. When done properly, the APV model results in the same value as the enterprise DCF value.

EXHIBIT 8.1 **Frameworks for DCF-Based Valuation**

Model	Measure	Discount factor	Assessment
Enterprise discounted cash flow	Free cash flow	Weighted average cost of capital	Works best for projects, business units, and companies that manage their capital structure to a target level.
Discounted economic profit	Economic profit	Weighted average cost of capital	Explicitly highlights when a company creates value.
Adjusted present value	Free cash flow	Unlevered cost of equity	Highlights changing capital structure more easily than WACC-based models.
Capital cash flow	Capital cash flow	Unlevered cost of equity	Compresses free cash flow and the interest tax shield in one number, making it difficult to compare operating performance among companies and over time.
Equity cash flow	Cash flow to equity	Levered cost of equity	Difficult to implement correctly because capital structure is embedded within the cash flow. Best used when valuing financial institutions.

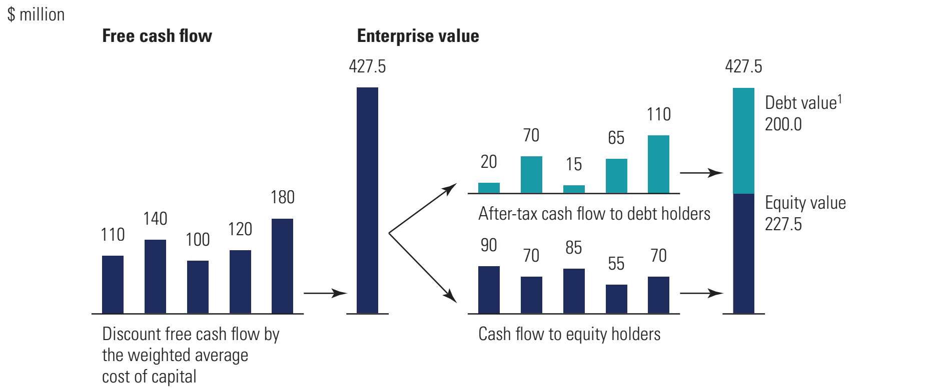
The chapter also includes a discussion of capital cash flow and equity cash flow valuation models. Properly implemented, these models will yield the same results as enterprise DCF. Given that they mix together operating performance and capital structure in cash flow, however, implementation errors can occur more easily. For this reason, we avoid capital cash flow and equity cash flow valuation models, except when valuing banks and other financial institutions, where capital structure is an inextricable part of operations (for how to value banks, see Chapter 34).

ENTERPRISE DISCOUNTED CASH FLOW MODEL

The enterprise DCF model discounts free cash flow, meaning the cash flow available to all investors—equity holders, debt holders, and any other nonequity investors—at the weighted average cost of capital, meaning the blended cost of capital for all investor capital. The debt and other nonequity claims on cash flow are subtracted from enterprise value to determine equity value.[1] Equity valuation models, in contrast, value directly the equity holders' cash flows. Exhibit 8.2 demonstrates the relationship between enterprise value and equity value. For this company, equity holders' value can be calculated

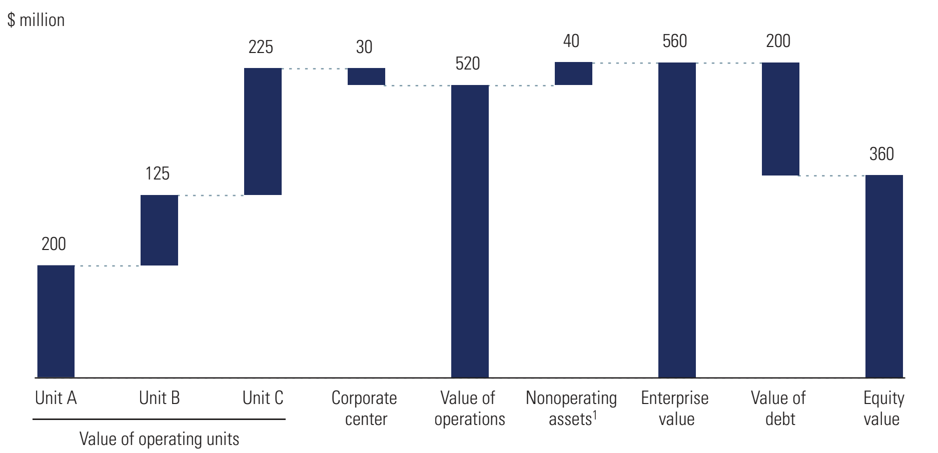
[1]Throughout this chapter, we refer to debt and other nonequity claims. Other nonequity claims arise when stakeholders have a claim against the company's future cash flow but do not hold traditional interest-bearing debt or common equity. Nonequity claims include debt equivalents (e.g., operating leases and unfunded pension liabilities) and hybrid securities (e.g., convertible debt and employee options).

EXHIBIT 8.2 **Enterprise Valuation of a Single-Business Company**



[1] Debt value equals discounted after-tax cash flow to debt holders plus the present value of interest tax shield.

EXHIBIT 8.3 **Enterprise Valuation of a Multibusiness Company**



[1] Including excess cash and marketable securities.

either directly at $227.5 million or by estimating enterprise value ($427.5 million) and subtracting debt ($200.0 million).

The enterprise DCF method is especially useful when applied to a multi-business company. As shown in Exhibit 8.3, the enterprise value equals the summed value of the individual operating units less the present value of the corporate-center costs, plus the value of nonoperating assets.[2] You can use the

[2]Many investment professionals define enterprise value as interest-bearing debt plus the market value of equity minus excess cash, whereas we define enterprise value as the value of operations plus nonoperating assets. The investment professional's definition of enterprise value more closely resembles our

enterprise DCF model to value individual projects, business units, and even the entire company with a consistent methodology.

Valuing a company's equity using enterprise DCF is a four-part process:

1. Value the company's operations by discounting free cash flow at the weighted average cost of capital.
2. Identify and value nonoperating assets, such as excess cash and marketable securities, nonconsolidated subsidiaries, and other assets not included in free cash flow. Summing the value of operations and nonoperating assets gives gross enterprise value.
3. Identify and value all debt and other nonequity claims against the enterprise value. Debt and other nonequity claims include fixed-rate and floating-rate debt, debt equivalents such as unfunded pension liabilities and restructuring provisions, employee options, preferred stock, and others that are discussed in Chapter 14.
4. Subtract the value of debt and other nonequity claims from enterprise value to determine the value of common equity. To estimate value per share, divide equity value by the number of current shares outstanding.

Exhibit 8.4 presents the results of an enterprise DCF valuation for United Parcel Service (UPS), the global delivery company. UPS is used throughout the chapter to compare valuation methods. We start by discounting each year's projected free cash flow by the company's weighted average cost of capital.[3] Next, sum the present values of all the annual cash flows to determine the present value of operations. For simplicity, the first year's projected cash flow is discounted by one full year, the second by two full years, and so on. Since cash flows are generated throughout the year, however, and not as a lump sum, discounting in full-year increments sets the discount factor too low. Therefore, adjust the present value upward by half a year.[4] The resulting value of operations for UPS is $117.8 billion.

To this value, add nonoperating assets of $4.3 billion (excess cash and other nonoperating assets) to estimate gross enterprise value of $122.1 billion. To determine equity value, subtract the value of debt and other nonequity claims. UPS has $10.9 billion in traditional debt, $5.0 billion in after-tax unfunded pension obligations, $5.8 billion in capitalized operating leases, and a small

definition of the value of operations for companies without other nonoperating assets (e.g., nonconsolidated subsidiaries) and debt equivalents (e.g., unfunded pension liabilities).

[3]To generate identical results across valuation methods, we have not adjusted figures for rounding error. Rounding errors occur in most exhibits.

[4]A half-year adjustment is made to the present value for UPS because we assume cash flow is generated symmetrically around the midyear point. For companies dependent on year-end holidays, cash flows will be more heavily weighted toward the latter half of the year. In this case, the adjustment should be smaller. For UPS, fourth-quarter revenues are only 10 percent higher than other quarters, so we use a half-year adjustment.

EXHIBIT 8.4 **UPS: Enterprise DCF Valuation**

Forecast year	**Free cash flow (FCF)**, $ million	**Discount factor**, @ 8.0%	**Present value of FCF**, $ million
2014	3,472	0.926	3,215
2015	4,108	0.857	3,522
2016	4,507	0.794	3,579
2017	4,892	0.735	3,596
2018	5,339	0.681	3,634
2019	5,748	0.630	3,623
2020	6,194	0.584	3,615
2021	6,678	0.541	3,609
2022	7,086	0.501	3,547
2023	7,523	0.463	3,486
Continuing value	168,231	0.463	77,967
Present value of cash flow			113,395
Midyear adjustment factor			1.039
Value of operations			117,840
Value of excess cash			4,136
Value of investments			148
Enterprise value			122,124
Less: Value of debt			(10,872)
Less: Value of after-tax unfunded retirement obligations			(5,042)
Less: Value of capitalized operating leases			(5,841)
Less: Value of noncontrolling interest			(14)
Equity value			100,355
Millions of shares outstanding (December 2013)			923
Equity value per share ($)			109

amount of noncontrolling interests.[5] Divide the resulting equity value of $100.4 billion by the number of shares outstanding (923 million) to estimate a per-share value of $109. During the middle part of 2014, when we performed this valuation, UPS's stock traded between $95 and $105 per share, well within a reasonable range of the DCF valuation (reasonable changes in forecast assumptions or WACC estimates can easily move a company's value by up to 15 percent).

Although this chapter presents the enterprise DCF valuation sequentially, valuation is an iterative process. To value operations, first reorganize the company's financial statements to separate operating items from nonoperating items and capital structure. Then analyze the company's historical performance; define and project free cash flow over the short, medium, and long

[5] A noncontrolling interest arises when an outside investor owns a minority share of a subsidiary. Since this outside investor has a partial claim on cash flows, the claim's value must be deducted from enterprise value to compute equity value.

run; and discount the projected free cash flows at the weighted average cost of capital.

Valuing Operations

The value of operations equals the discounted value of future free cash flow. Free cash flow equals the cash flow generated by the company's operations, less any reinvestment back into the business. As defined at the beginning of this section, free cash flow is the cash flow available to all investors—equity holders, debt holders, and any other nonequity investors—so it is independent of capital structure. Consistent with this definition, free cash flow must be discounted using the weighted average cost of capital, because the WACC represents rates of return required by the company's debt and equity holders blended together. It is the company's opportunity cost of funds.

Reorganizing the financial statements A robust valuation model requires a clear account of financial performance. Although ROIC and free cash flow (FCF) are critical to the valuation process, they cannot be computed directly from a company's reported financial statements, which mix operating performance, nonoperating performance, and capital structure. Therefore, to calculate ROIC and FCF, first reorganize the accounting financial statements into new statements that separate operating items, nonoperating items, and capital structure.

This reorganization leads to two new terms: invested capital and net operating profit less adjusted taxes (NOPLAT). Invested capital represents the investor capital required to fund operations, without distinguishing how the capital is financed. NOPLAT represents the total after-tax operating income generated by the company's invested capital, available to all investors.

Exhibit 8.5 presents the historical NOPLAT and invested capital for UPS and one of its direct competitors, FedEx. To calculate ROIC, divide NOPLAT by average invested capital. In 2013, UPS's return on invested capital equaled 16.9 percent (based on a two-year average of invested capital), double its weighted average cost of capital of 8.0 percent.[6]

Next, use the reorganized financial statements to calculate free cash flow, which will be the basis for our valuation. Defined in a manner consistent with ROIC, free cash flow is derived directly from NOPLAT and the change in invested capital. Unlike the accounting statement of cash flows (provided in the company's annual report), free cash flow is independent of nonoperating items and capital structure.

Exhibit 8.6 presents historical free cash flow for both UPS and FedEx. As seen in the exhibit, UPS generated $3.9 billion in free cash flow in 2013,

[6]Chapter 9 details why it is important to measure ROIC both with and without goodwill and acquired intangibles.

EXHIBIT 8.5 **UPS and FedEx: Historical ROIC Analysis**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Revenues	53,105	54,127	55,438	42,680	44,287	45,567
Compensation and benefits[1]	(26,908)	(27,581)	(28,941)	(16,133)	(16,547)	(16,688)
Purchased transportation	(7,232)	(7,354)	(7,486)	(6,335)	(7,272)	(8,011)
Fuel	(4,046)	(4,090)	(4,027)	(4,956)	(4,746)	(4,557)
Depreciation	(1,554)	(1,614)	(1,682)	(2,095)	(2,359)	(2,564)
Amortization, capitalized software	(206)	(216)	(165)	–	–	–
Other expenses[2]	(6,151)	(6,147)	(6,164)	(8,751)	(9,109)	(9,300)
Operating EBITA	7,008	7,125	6,973	4,410	4,254	4,447
Operating cash taxes	(2,155)	(2,238)	(2,289)	(725)	(1,297)	(1,540)
NOPLAT	4,853	4,887	4,684	3,685	2,957	2,907
Invested capital						
Operating working capital	2,119	1,719	1,648	1,577	1,211	1,853
Property, plant, and equipment, net	17,621	17,894	17,961	17,248	18,484	19,550
Capitalized operating leases	5,684	5,428	5,841	20,688	22,195	23,427
Intangible assets, capitalized software	388	415	523	–	–	–
Other operating assets, net of liabilities	(1,060)	(948)	(984)	(705)	(903)	(1,031)
Invested capital (excluding goodwill)[3]	24,752	24,508	24,989	38,808	40,987	43,799
Goodwill and acquired intangibles, less tax gross-up	2,225	2,295	2,349	2,408	2,800	2,826
Cumulative amortization and impairment	636	655	667	2,026	2,043	2,057
Invested capital (including goodwill)[3]	27,614	27,458	28,004	43,242	45,830	48,682
Return on invested capital, %						
ROIC excluding goodwill (average)[3]	19.9	19.8	18.9	9.8	7.4	6.9
ROIC including goodwill (average)[3]	17.8	17.7	16.9	8.8	6.6	6.2

[1] Compensation and benefits, excluding severance, other restructuring charges, and pension adjustments.
[2] Other expenses, excluding gains (losses) on asset sales, operating lease interest, and deferred gains on sale/leaseback transactions.
[3] Goodwill includes goodwill and acquired intangibles, cumulative amortization and impairments, less tax gross-up related to amortization.

versus close to zero free cash flow for FedEx, which reinvested a much greater percentage of its profits back into the business.

Analyzing historical performance Once the company's financial statements are reorganized, analyze the company's historical financial performance. By thoroughly analyzing the past, we can understand whether the company has created value, how fast it has grown, and how it compares with its competitors. A good analysis will focus on the key drivers of value: return on invested capital, revenue growth, and free cash flow. Understanding how these drivers behaved in the past will help you make more reliable estimates of future cash flow.

Exhibit 8.7 presents a 10-year summary of UPS's pretax operating margin and its components, a critical driver of return on invested capital. This analysis points to a number of trends, including a slight decline in compensation

EXHIBIT 8.6 **UPS and FedEx: Free Cash Flow Calculation**

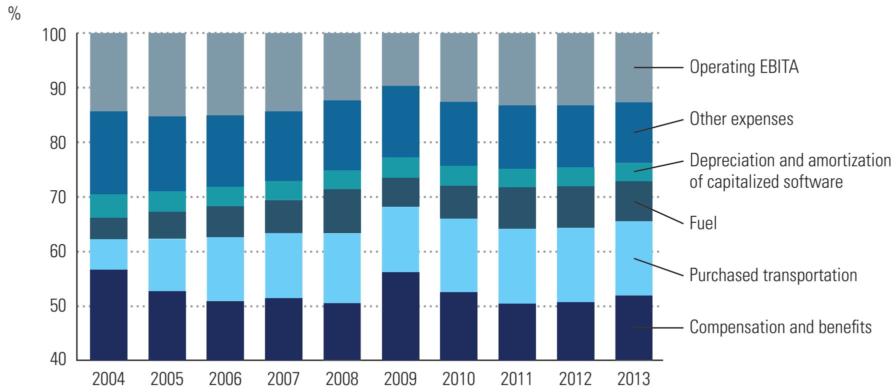
$ million

	UPS			FedEx		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
NOPLAT	4,853	4,887	4,684	3,685	2,957	2,907
Depreciation	1,554	1,614	1,682	2,095	2,359	2,564
Amortization of capitalized software	206	216	165	–	–	–
Gross cash flow	6,613	6,717	6,531	5,780	5,316	5,471
Decrease (increase) in operating working capital	92	401	71	(308)	366	(643)
Capital expenditures, net of disposals	(1,788)	(1,887)	(1,749)	(3,800)	(3,595)	(3,630)
Investments in capitalized operating leases	(39)	255	(412)	(694)	(1,507)	(1,232)
Investments in capitalized software	(229)	(243)	(273)	–	–	–
Investments in goodwill and acquired intangibles	(11)	(88)	(66)	(70)	(409)	(40)
Decrease (increase) in other operating assets, net of liabilities	(470)	(112)	36	(12)	1981	28
Foreign-currency translation	(92)	294	(260)	(95)	41	(25)
Gross investment	(2,538)	(1,380)	(2,654)	(4,979)	(4,906)	(5,441)
Free cash flow	4,075	5,337	3,877	802	409	30
Nonoperating income (expenses)	357	(387)	301	382	(16)	484
Decrease (increase) in excess cash	(129)	(3,629)	2,698	(447)	(2,042)	2,035
Decrease (increase) in other nonoperating assets	458	271	53	–	–	–
Nonoperating cash flow	686	(3,745)	3,052	(65)	(2,058)	2,519
Cash flow available to investors	4,761	1,592	6,930	737	(1,649)	2,548
Reconciliation of cash flow available to investors						
Interest expense	348	393	380	52	82	160
Operating lease interest expense	272	233	264	1,126	1,017	1,132
Decrease (increase) in debt	(282)	(1,742)	1,998	18	(1,323)	(1,747)
Decrease (increase) in capitalized operating leases	(39)	255	(412)	(694)	(1,507)	(1,232)
Pension and postretirement benefits, net cash out (in)[1]	187	(479)	(811)	113	59	(109)
Flows to debt holders	486	(1,339)	1,419	615	(1,672)	(1,796)
Cash dividends	2,086	2,243	2,367	164	176	187
Repurchased (issued) shares	2,194	695	3,078	(42)	(153)	4,157
Decrease (increase) in noncontrolling interests	(5)	(7)	66	–	–	–
Flows to equity holders	4,275	2,931	5,511	122	23	4,344
Cash flow available to investors	4,761	1,592	6,930	737	(1,649)	2,548

[1] Change in pension and postretirement benefits is detailed in Exhibit 8.16.

and benefits (as a percentage of revenue), higher purchased transportation, and nearly double the fuel costs. In aggregate, these trends led to a lower operating margin, which has recently stabilized near 13 percent. Similar to many transportation-related companies, UPS reported lower compensation and benefits during the mid-2000s, but the majority of the decline occurred during the acquisition of Menlo Worldwide Forwarding and Overnite, making a clean like-to-like comparison challenging. Purchased transportation has increased as UPS relies on third-party carriers to transport its packages outside the United

EXHIBIT 8.7 **UPS: Operating Margin Analysis**



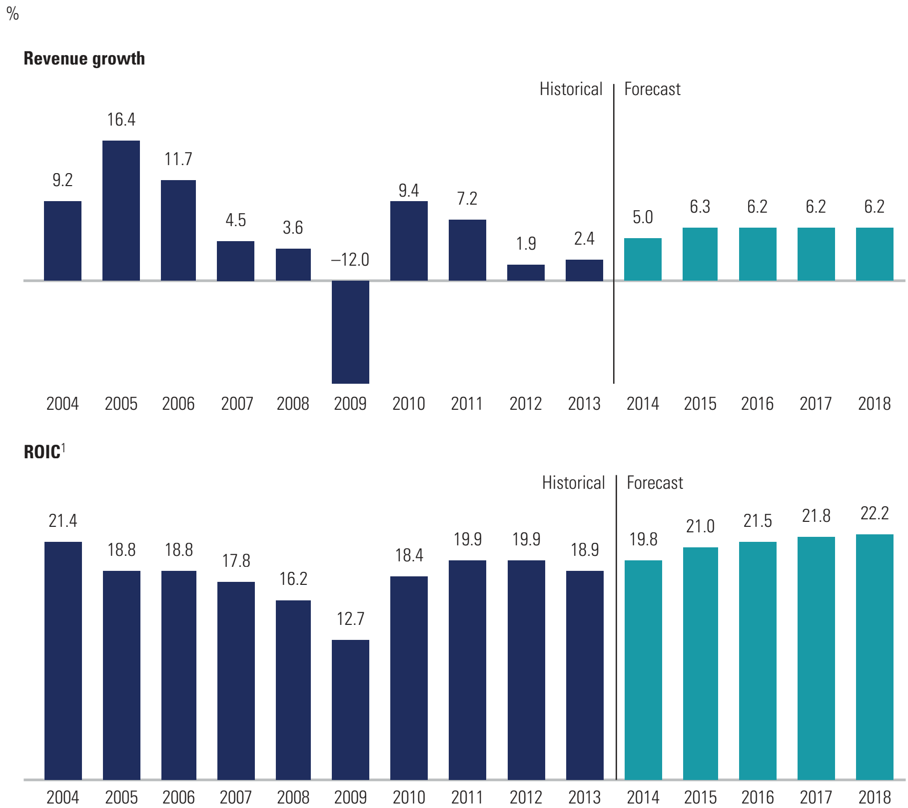
States. Finally, fuel costs increased as a percentage of sales over the decade, as UPS was unable to pass the rise in oil prices to its customers.

Projecting revenue growth, ROIC, and free cash flow The next task in building an enterprise DCF valuation is to project revenue growth, return on invested capital, and free cash flow. Exhibit 8.8 graphs historical and projected revenue growth and ROIC for UPS, using analyst forecasts as the basis for projections. As the graphs demonstrate, the company's revenue growth dropped to the low single digits during 2012 and 2013 as the company's international shipping business stalled. As international growth rates return to historical levels, the analyst community believes growth will rise slightly and stabilize near 5 percent. The analyst community also predicts a continuation of margin expansion, reflecting a general trend upward from the lows experienced during the financial crisis of 2008.

Projections for revenue, margin, and invested capital lead to a corresponding projection of free cash flow. Exhibit 8.9 shows a summarized free-cash-flow calculation for UPS.[7] Note how the projection of cash flow is lower than historical levels. In 2012, UPS generated higher-than-usual cash flow as it drew down working capital and relied on fewer leased assets. The company also used a smaller proportion of property, plant, and equipment (as a percentage of sales). Going forward, we hold the percentage constant, leading to higher capital expenditures, and consequently lower free cash flow.

[7]Free cash flow does not incorporate any financing-related cash flows such as interest expense or dividends. A good stress test for an enterprise valuation model is to change future interest rates or dividend payout ratios and observe free cash flow. Free-cash-flow forecasts should not change when you adjust the cost of debt or dividend policy.

EXHIBIT 8.8 **UPS: Projected Revenue Growth and ROIC**



[1] ROIC measured using two-year average invested capital excluding goodwill and acquired intangibles.

When building the forecast model, use judgment on how much detail to forecast at various points. Over the short run (the first few years), forecast each financial-statement line item, such as gross margin, selling expenses, accounts receivable, and inventory (see Chapter 11 for detail on how to forecast cash flows). This will allow you to capture visible trends in individual line items. Moving further out, individual line items become difficult to project, and a high level of detail can obscure the critical value drivers. Therefore, over the medium horizon (five to 10 years), focus on the company's key value drivers, such as operating margin, the operating tax rate, and capital efficiency. At some point, projecting even key drivers on a year-by-year basis becomes meaningless. To value cash flows beyond this point, use a continuing-value formula, often called the terminal value. Choosing an appropriate point of transition depends on the company and how it is changing over time. A company in predictable transition may require a long, detailed window, whereas a stable, mature company may require very little detail in your forecasts.

EXHIBIT 8.9 **UPS: Projected Free Cash Flow**

$ million

	Historical			Forecast		
	2011	2012	2013	2014	2015	2016
NOPLAT	4,853	4,887	4,684	5,099	5,773	6,256
Depreciation	1,554	1,614	1,682	1,688	1,773	1,884
Amortization of capitalized software	206	216	165	208	218	232
Gross cash flow	6,613	6,717	6,531	6,995	7,764	8,372
Decrease (increase) in operating working capital	92	401	71	(82)	(109)	(113)
Capital expenditures, net of disposals	(1,788)	(1,887)	(1,749)	(2,586)	(2,958)	(3,121)
Investments in capitalized operating leases	(39)	255	(412)	(670)	(402)	(430)
Investments in capitalized software	(229)	(243)	(273)	(234)	(253)	(268)
Investments in goodwill and acquired intangibles	(11)	(88)	(66)	–	–	–
Decrease (increase) in other operating assets, net of liabilities	(470)	(112)	36	49	65	68
Foreign-currency translation	(92)	294	(260)	–	–	–
Gross investment	(2,538)	(1,380)	(2,654)	(3,523)	(3,656)	(3,865)
Free cash flow	4,075	5,337	3,877	3,472	4,108	4,507

Estimating continuing value At the point where predicting the individual key value drivers on a year-by-year basis becomes impractical, do not vary the individual drivers over time. Instead, use a perpetuity-based continuing value, such that:

$$\text{Value of Operations} = \begin{array}{c}\text{PV of Free Cash Flow}\\ \text{during Explicit Forecast Period}\end{array} + \begin{array}{c}\text{PV of Free Cash Flow}\\ \text{after Explicit Forecast Period}\end{array}$$

Although many continuing-value models exist, we prefer the key value driver formula presented in Chapter 2. The key value driver formula is superior to alternative methodologies because it is based on cash flow and links cash flow directly to growth and ROIC. The key value driver formula is expressed as follows:

$$\text{Continuing Value}_t = \frac{\text{NOPLAT}_{t+1}\left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

The formula requires a forecast of net operating profit less adjusted taxes (NOPLAT) in the year *following* the end of the explicit forecast period, the long-run forecast for return on new invested capital (RONIC), the weighted average cost of capital (WACC), and long-run growth (g) in NOPLAT.

Exhibit 8.10 presents an estimate for UPS's continuing value. Based on a final-year estimate of NOPLAT ($9.7 billion), return on new investment (22.4 percent), and a long-term growth rate of 3.0 percent, the continuing value is estimated at $168.2 billion. This value is then discounted into today's dollars and added to the value from the explicit forecast period to determine

EXHIBIT 8.10 **UPS: Continuing Value**

$ million

Key inputs[1]	
Projected NOPLAT in 2024	9,700
NOPLAT growth rate in perpetuity (*g*)	3.0%
Return on new invested capital (RONIC)	22.4%
Weighted average cost of capital (WACC)	8.0%

$$\text{Continuing value}_t = \frac{\text{NOPLAT}_{t+1}\left(1 - \frac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

$$= 168{,}231$$

[1] Rounded inputs calculate to $168,018 million, whereas this model uses unrounded data.

UPS's operating value. (Exhibit 8.4 discounts continuing value in 2023 back to 2014.)

Alternative methods and additional details for estimating continuing value are provided in Chapter 12.

Discounting free cash flow at the weighted average cost of capital To determine the present value of operations, discount each year's forecast of free cash flow for time and risk. When discounting any set of cash flows, make sure to define the cash flows and discount factor consistently. In an enterprise valuation, free cash flows are available to all investors. Consequently, the discount factor for free cash flow must represent the risk faced by all investors. The weighted average cost of capital (WACC) blends the rates of return required by debt holders (k_d) and equity holders (k_e). For a company financed solely with debt and equity, the WACC is defined as follows:

$$\text{WACC} = \frac{D}{D+E}k_d(1 - T_m) + \frac{E}{D+E}k_e$$

where debt (D) and equity (E) are measured using market values. Note how the cost of debt has been reduced by the marginal tax rate (T_m). The reason for doing this is that the tax shield attributable to interest has been excluded from free cash flow. Since the interest tax shield (ITS) has value, it must be incorporated in the valuation. Enterprise DCF values the tax shield by reducing the weighted average cost of capital.

Why move interest tax shields from free cash flow to the cost of capital? By calculating free cash flow as if the company were financed entirely with equity, one can compare operating performance across companies and over time without regard to capital structure. By focusing solely on operations, it is possible to develop a clearer picture of historical performance, and this leads to better performance measurement and forecasting.

Although applying the weighted average cost of capital is intuitive and relatively straightforward, it has some drawbacks. If you discount all future cash flows with a constant cost of capital, as most analysts do, you are implicitly assuming the company keeps its capital structure constant at a target ratio of

EXHIBIT 8.11 **UPS: Weighted Average Cost of Capital**

%

Source of capital	Proportion of total capital	Cost of capital	Marginal tax rate	After-tax cost of capital	Contribution to weighted average
Debt	15.0	4.9	37.1	3.1	0.5
Equity	85.0	8.9		8.9	7.5
WACC	100.0				8.0

debt to equity. But if a company plans, say, to increase its debt-to-value ratio, the current cost of capital will understate the expected tax shields. The WACC can be adjusted to accommodate a changing capital structure. However, the process is complicated, and in these situations, we recommend an alternative method such as adjusted present value (APV).

The weighted average cost of capital for UPS is presented in Exhibit 8.11. UPS's 8.0 percent WACC is based on a cost of equity of 8.9 percent, pretax cost of debt of 4.9 percent, and a 15 percent/85 percent split between debt and equity.

Identifying and Valuing Nonoperating Assets

Many companies own assets that have value but whose cash flows are not part of the operations of the business and are not included in accounting revenue or operating profit. As a result, the cash generated by these assets is not part of free cash flow and must be valued separately.

For example, consider equity investments, known outside the United States as nonconsolidated subsidiaries. When a company owns a small minority stake in another company, it will not record the company's revenue or costs as part of its own. Instead, the company will record only its proportion of the other company's net income as a separate line item.[8] Including net income from nonconsolidated subsidiaries as part of the parent's operating profit will distort margins, since only the subsidiaries' profit is recognized and not the corresponding revenues. Consequently, nonconsolidated subsidiaries are best analyzed and valued separately. Other nonoperating assets include excess cash, tradable securities, and customer-financing business units. A detailed process for identifying and valuing nonoperating assets appears in Chapter 14.

[8]For stakes between 20 percent and 50 percent, the parent company will recognize its proportion of the subsidiary's income. A parent that owns less than a 20 percent stake in another company records only dividends paid as part of its own income. This makes valuation of stakes less than 20 percent extremely challenging.

Identifying and Valuing Debt and Other Nonequity Claims

To convert enterprise value into equity value, subtract debt and other nonequity claims, such as unfunded retirement liabilities, capitalized operating leases, and outstanding employee options. Common equity is a residual claimant, receiving cash flows only *after* the company has fulfilled its other contractual claims. Careful analysis of all potential claims against cash flows is therefore critical.

Nonequity claims on a company's cash flow are not always easy to spot. Many of the accounting scandals that led to the Sarbanes-Oxley legislation in the United States involved undisclosed or carefully hidden liabilities. Even 10 years later, however, hidden liabilities remain an issue for investors. For instance, Netflix was recently accused of failing to disclose $3.7 billion in contractual promises to production companies.[9] In this case, many of these promises are operating related and would already be incorporated into projections of free cash flow. Nonetheless, these promises are a priority claim on the company's assets and need to be assessed accordingly.

Although a comprehensive list of nonequity claims is impractical, here are the most common:

- *Debt:* If available, use the market value of all outstanding debt, including fixed- and floating-rate debt. If that information is unavailable, the book value of debt is a reasonable proxy, unless the probability of default is high or interest rates have changed dramatically since the debt was originally issued. Any valuation of debt, however, should be consistent with your estimates of enterprise value. (See Chapter 14 for more details.)
- *Operating leases:* Under certain conditions, companies can avoid capitalizing leases as debt on their balance sheets, although required payments must be disclosed in the footnotes.
- *Unfunded retirement liabilities:* Companies with defined-benefit pension plans and promised retiree medical benefits may have unfunded obligations that should be treated like debt.
- *Preferred stock:* Although the name denotes equity, preferred stock more closely resembles unsecured debt.
- *Employee options:* Many companies offer their employees compensation in the form of options. Since options give the employee the right to buy company stock at a discounted price, they can have great value and must also be factored into equity value.
- *Noncontrolling interests:* When a company controls a subsidiary but does not own 100 percent, the investment must be consolidated on the parent

[9] "The Scary $3B Bomb Not on Netflix's Balance Sheet," Bloomberg TV, July 5, 2012.

company's balance sheet. The funding other investors provide is recognized on the parent company's balance sheet as noncontrolling interests (formerly called minority interest). When valuing noncontrolling interest, it is important to realize that the minority interest holder does not have a claim on the company's assets, but rather a claim on the subsidiary's assets.

The identification and valuation of nonequity claims are covered in detail in Chapter 14. A detailed discussion of how to analyze operating leases, unfunded pension liabilities, and employee options is presented in Chapter 20.

A common mistake made when valuing companies is to double-count claims already deducted from cash flow. Consider a company with a pension shortfall. You have been told the company will make extra payments to eliminate the liability. If you deduct the present value of the liability from enterprise value, you should not model the extra payments within free cash flow; that would mean double-counting the shortfall (once in cash flow and once as a debtlike claim), leading to an underestimate of equity value.

Valuing Equity

Once you have identified and valued all nonequity claims, subtract the claims from enterprise value to determine equity value. UPS has $10.8 in traditional debt, $5.0 billion in after-tax unfunded pension obligations, $5.8 in capitalized operating leases, and a negligible amount of noncontrolling interests. To value UPS's common equity, subtract each of these claims from UPS's enterprise value (see Exhibit 8.4).

To determine UPS's share price, divide the estimated common-stock value by the number of *undiluted* shares outstanding. Do not use diluted shares. Convertible debt and employee stock options should be valued separately. If one were to use diluted shares, one would be double-counting the options' value. Although UPS has an employee options plan, the plan is negligible and therefore has not been incorporated into the valuation.

At the end of fiscal year 2013, UPS had 923 million shares outstanding.[10] Dividing the equity estimate of $100.4 billion by 923 million shares generates an estimated value of $109 per share. The estimated value assumes UPS can maintain organic revenue growth at average historical levels while improving

[10] At year-end 2013, UPS had 212 million Class A shares and 712 million Class B shares outstanding, and held 1 million shares in treasury. The Class A shares have 10 times as many votes as the Series B shares and are held by employees and retirees. To liquidate a Class A share, employees must convert to Class B. In this case, we do not expect the two classes to trade at different values. In countries with weak shareholder protections, however, super-voting rights can lead to expropriation and potentially to differences in value.

return on invested capital from 19 to 22 percent, matching the company's best performance in the last decade.

ECONOMIC-PROFIT-BASED VALUATION MODELS

The enterprise DCF model is a favorite of academics and practitioners because it relies solely on how cash flows in and out of the company. Complex accounting can be replaced with a simple question: Does cash change hands? One shortfall of enterprise DCF, however, is that each year's cash flow provides little insight into the company's competitive position and economic performance. Declining free cash flow can signal either poor performance or investment for the future. The economic-profit model highlights how and when the company creates value, yet leads to a valuation that is identical to that of enterprise DCF.

Economic profit measures the value created by the company in a single period and is defined as follows:

$$\text{Economic Profit} = \text{Invested Capital} \times (\text{ROIC} - \text{WACC})$$

Since ROIC equals NOPLAT divided by invested capital, we can rewrite the equation as follows:

$$\text{Economic Profit} = \text{NOPLAT} - (\text{Invested Capital} \times \text{WACC})$$

Exhibit 8.12 presents economic-profit calculations for UPS using both methods. Not surprisingly, with an ROIC more than double its cost of capital, UPS generates significant economic profits. Economic profits fell slightly in 2013, however, as UPS increased invested capital but did not see a corresponding increase in NOPLAT.

To demonstrate how economic profit can be used to value a company—and to demonstrate its equivalence to enterprise DCF—consider a stream of growing cash flows valued using the growing-perpetuity formula:

$$\text{Value}_0 = \frac{\text{FCF}_1}{\text{WACC} - g}$$

In Chapter 2, we transformed this cash flow perpetuity into the key value driver model. The key value driver model is superior to the simple cash flow perpetuity model, because it explicitly models the relationship between growth and required investment. Using a few additional algebraic steps (detailed in Appendix A) and the assumption that the company's ROIC on new projects

EXHIBIT 8.12 **UPS: Economic-Profit Summary**

$ million

	Historical			Forecast		
	2011	2012	2013	2014	2015	2016
Method 1:						
Return on invested capital, %[1]	20.2	19.7	19.1	20.4	21.7	22.1
Weighted average cost of capital, %	7.4	7.5	8.0	8.0	8.0	8.0
Economic spread, %	12.7	12.2	11.1	12.4	13.7	14.1
× Invested capital	24,077	24,752	24,508	24,989	26,616	28,281
= Economic profit	3,061	3,023	2,726	3,102	3,645	3,995
Method 2:						
Invested capital[1]	24,077	24,752	24,508	24,989	26,616	28,281
× Weighted average cost of capital, %	7.4	7.5	8.0	8.0	8.0	8.0
Capital charge	1,792	1,864	1,958	1,998	2,128	2,261
NOPLAT	4,853	4,887	4,684	5,099	5,773	6,256
Capital charge	(1,792)	(1,864)	(1,958)	(1,998)	(2,128)	(2,261)
	3,061	3,023	2,726	3,102	3,645	3,995
Economic profit, including goodwill	2,849	2,808	2,491	2,861	3,404	3,754

[1] Invested capital measured at the beginning of the year, excluding goodwill and acquired intangibles.

equals historical ROIC, it is possible to transform the cash flow perpetuity into a key value driver model based on economic profits:

$$\text{Value}_0 = \text{Invested Capital}_0 + \frac{\text{Invested Capital}_0 \times (\text{ROIC} - \text{WACC})}{\text{WACC} - g}$$

Finally, we substitute the definition of economic profit:

$$\text{Value}_0 = \text{Invested Capital}_0 + \frac{\text{Economic Profit}_1}{\text{WACC} - g}$$

As can be seen in the economic-profit-based key value driver model, the operating value of a company equals its book value of invested capital plus the present value of all future value created. In this case, the future economic profits are valued using a growing perpetuity, because the company's economic profits are increasing at a constant rate over time. The formula also demonstrates that when future economic profit is expected to be zero, the value of operations will equal invested capital. If a company's value of operations exceeds its invested capital, be sure to identify the sources of competitive advantage that allows the company to maintain superior financial performance.

More generally, economic profit can be valued as follows:

$$\text{Value}_0 = \text{Invested Capital}_0 + \sum_{t=1}^{\infty} \frac{\text{Economic Profit}_t}{(1 + \text{WACC})^t}$$

Since the economic-profit valuation was derived directly from the free cash flow model (see Appendix A for a general proof of equivalence), any valuation based on discounted economic profits will be identical to enterprise DCF. To assure equivalence, however, it is necessary to:

- Use beginning-of-year invested capital (i.e., last year's value) instead of average or current-year invested capital.
- Define invested capital for both economic profit and ROIC using the same value. For example, ROIC can be measured either with or without goodwill. If you measure ROIC without goodwill, invested capital must also be measured without goodwill. All told, it doesn't matter how you define invested capital, as long as you are consistent.
- Use a constant cost of capital to discount projections.

Exhibit 8.13 presents the valuation results for UPS using economic profit. Economic profits are explicitly forecast for 10 years; the remaining years are valued using an economic-profit continuing-value formula.[11] Comparing the equity value from Exhibit 8.4 with that of Exhibit 8.13, we see that the estimate of UPS's DCF value is the same, regardless of the method.

The benefits of economic profit become apparent when we examine the drivers of economic profit, ROIC and WACC, on a year-by-year basis in Exhibit 8.13. The current valuation is contingent on a small and gradual improvement in ROIC from 20.4 percent to 22.5 percent, conservative by most measures, but higher than the last 10 years. Note how the ROIC rises initially, but falls slightly in the outer years, as UPS's lower-margin supply chain business outgrows its higher-margin international business.

[11] To calculate continuing value, you can use the economic-profit-based key value driver formula, but only if RONIC equals historical ROIC in the continuing-value year. If RONIC going forward differs from the final year's ROIC, then the equation must be separated into current and future economic profits:

$$\text{Value}_t = \text{IC}_t + \underbrace{\frac{\text{IC}_t(\text{ROIC}_{t+1} - \text{WACC})}{\text{WACC}}}_{\text{Current Economic Profits}} + \underbrace{\frac{\text{PV(Economic Profit}_{t+2})}{\text{WACC} - g}}_{\text{Future Economic Profits}}$$

such that:

$$\text{PV(Economic Profit}_{t+2}) = \frac{\text{NOPLAT}_{t+1}\left(\frac{g}{\text{RONIC}}\right)(\text{RONIC} - \text{WACC})}{\text{WACC}}$$

EXHIBIT 8.13 **UPS: Valuation Using Economic Profit**

Year	Invested capital,[1] $ million	ROIC,[1] %	WACC, %	Economic profit, $ million	Discount factor, @ 8.0%	Present value of economic profit, $ million
2014	24,989	20.4	8.0	3,102	0.926	2,872
2015	26,616	21.7	8.0	3,645	0.857	3,126
2016	28,281	22.1	8.0	3,995	0.794	3,172
2017	30,030	22.5	8.0	4,359	0.735	3,205
2018	31,897	22.9	8.0	4,744	0.681	3,230
2019	33,853	22.8	8.0	5,012	0.630	3,159
2020	35,823	22.7	8.0	5,280	0.584	3,082
2021	37,773	22.6	8.0	5,520	0.541	2,983
2022	39,635	22.6	8.0	5,771	0.501	2,888
2023	41,487	22.5	8.0	6,021	0.463	2,790
Continuing value				124,929	0.463	57,899
Present value of economic profit						88,406
Invested capital in 2013						24,989
Invested capital and economic profit						113,395
Midyear adjustment factor						1.039
Value of operations						117,840
Value of excess cash						4,136
Value of investments						148
Enterprise value						122,124
Less: Value of debt						(10,872)
Less: Value of unfunded retirement obligations						(5,042)
Less: Value of capitalized operating leases						(5,841)
Less: Value of noncontrolling interest						(14)
Equity value						100,355

[1] Invested capital measured at the beginning of the year with goodwill and acquired intangibles.

Explicitly modeling ROIC as a primary driver of economic profit prominently displays expectations of value creation. Conversely, the free cash flow model fails to show this dynamic. Free cash flow commingles ROIC and growth, two critical but very different value drivers.

Also note how the UPS's high ROIC—double its cost of capital—leads to an operating value that greatly exceeds the book value of its invested capital ($117.8 billion versus $25.0 billion).

ADJUSTED PRESENT VALUE MODEL

When building an enterprise DCF or economic-profit valuation, most financial analysts discount all future flows at a constant weighted average cost of capital. Using a constant WACC, however, assumes the company manages its capital structure to a target debt-to-value ratio.

In most situations, debt grows in line with company value. But suppose the company planned to change its capital structure significantly. Indeed, companies with a high proportion of debt often pay it down as cash flow improves, thus lowering their future debt-to-value ratios. In these cases, a valuation based on a constant WACC would overstate the value of the tax shields. Although the WACC can be adjusted yearly to handle a changing capital structure, the process is complex. Therefore, we turn to an alternative model: adjusted present value (APV).

The APV model separates the value of operations into two components: the value of operations as if the company were all-equity financed and the value of tax shields that arise from debt financing:[12]

$$\begin{array}{c}\text{Adjusted}\\ \text{Present Value}\end{array} = \begin{array}{c}\text{Enterprise Value as if the}\\ \text{Company were All – Equity Financed}\end{array} + \begin{array}{c}\text{Present Value of}\\ \text{Tax Shields}\end{array}$$

The APV valuation model follows directly from the teachings of economists Franco Modigliani and Merton Miller, who proposed that in a market with no taxes (among other things), a company's choice of financial structure will not affect the value of its economic assets. Only market imperfections, such as taxes and distress costs, affect enterprise value.

When building a valuation model, it is easy to forget these teachings. To see this, imagine a company (in a world with no taxes) that has a 50/50 mix of debt and equity. If the company's debt has an expected return of 5 percent and the company's equity has an expected return of 15 percent, its weighted average cost of capital would be 10 percent. Suppose the company decides to issue more debt, using the proceeds to repurchase shares. Since the cost of debt is lower than the cost of equity, it would appear that issuing debt to retire equity should lower the WACC, raising the company's value.

This line of thinking is flawed, however. In a world without taxes, a change in capital structure would not change the cash flow generated by operations, nor the risk of those cash flows. Therefore, neither the company's enterprise value nor its cost of capital would change. So why did we think it would? When adding debt, we adjusted the weights, but we failed to properly increase the cost of equity. Since debt payments have priority over cash flows to equity, adding leverage increases the risk to equity holders. When leverage rises, they demand a higher return. Modigliani and Miller postulated that this increase would perfectly offset the change in weights.

[12]This book focuses on the tax shields generated by interest expense. On a more general basis, the APV values any incremental cash flows associated with capital structure, such as tax shields, issue costs, and distress costs. Distress costs include direct costs, such as court-related fees, and indirect costs, such as the loss of customers and suppliers.

In reality, taxes play a role in determining capital structure. Since interest is tax deductible, profitable companies can lower taxes by raising debt. But if the company relies too heavily on debt, the company's customers and suppliers may fear financial distress and be reluctant to do business with the company, reducing future cash flow (academics call this distress costs or deadweight costs). Rather than model the effect of capital-structure changes in the weighted average cost of capital, APV explicitly measures and values the cash flow effects of financing separately.

To build an APV valuation, value the company as if it were all-equity financed. Do this by discounting free cash flow by the unlevered cost of equity (what the cost of equity would be if the company had no debt).[13] To this value, add any value created by the company's use of debt. Exhibit 8.14 values UPS using adjusted present value. Since we assume (for expositional purposes) that UPS will manage its capital structure to a target debt-to-value level of 15 percent, the APV-based valuation leads to the same value for equity as did enterprise DCF (see Exhibit 8.4) and economic profit (see Exhibit 8.13). A simplified proof of equivalence between enterprise DCF and adjusted present value can be found in Appendix B. The following subsections explain adjusted present value in detail.

Valuing Free Cash Flow at Unlevered Cost of Equity

When valuing a company using the APV, explicitly separate the unlevered value of operations (V_u) from any value created by financing, such as tax shields (V_{txa}). For a company with debt (D) and equity (E), this relationship is as follows:

$$V_u + V_{txa} = D + E \tag{8.1}$$

A second result of Modigliani and Miller's work is that the total risk of the company's assets, real and financial, must equal the total risk of the financial claims against those assets. Thus, in equilibrium, the blended cost of capital for operating assets (k_u, which we call the unlevered cost of equity) and financial assets (k_{txa}) must equal the blended cost of capital for debt (k_d) and equity (k_e):

$$\frac{V_u}{V}k_u + \frac{V_{txa}}{V}k_{txa} = \frac{D}{V}k_d + \frac{E}{V}k_e \tag{8.2}$$

In the corporate-finance literature, academics combine Modigliani and Miller's two equations to solve for the cost of equity (k_e) in order to

[13] Free cash flow projections in the APV model are identical to those presented in Exhibit 8.4. Continuing value is computed using the key value driver formula. Only the cost of capital is used for discounting changes.

EXHIBIT 8.14 **UPS: Valuation Using Adjusted Present Value**

Year	Free cash flow, $ million	Interest tax shield (ITS), $ million	Discount factor, @ 8.3%	Present value of FCF, $ million	Present value of ITS, $ million
2014	3,472	317	0.924	3,207	293
2015	4,108	321	0.853	3,505	274
2016	4,507	335	0.788	3,552	264
2017	4,892	350	0.728	3,561	255
2018	5,339	365	0.672	3,589	245
2019	5,748	379	0.621	3,570	236
2020	6,194	394	0.574	3,553	226
2021	6,678	409	0.530	3,538	217
2022	7,086	424	0.489	3,468	207
2023	7,523	439	0.452	3,401	198
Continuing value	159,616	8,615	0.452	72,153	3,894
Present value				107,096	6,310

Present value of free cash flow	107,096
Present value of interest tax shields	6,310
Present value of free cash flow and interest tax shields	113,406
Midyear adjustment factor	1.039
Value of operations	117,852
Value of excess cash	4,136
Value of long-term investments	148
Enterprise value	122,136
Less: Value of debt	(10,872)
Less: Value of unfunded retirement obligations	(5,042)
Less: Value of capitalized operating leases	(5,841)
Less: Value of noncontrolling interest	(14)
Equity value	100,367

demonstrate the relationship between leverage and the cost of equity. Appendix C algebraically rearranges equation 8.2 to solve for the most general version of the levered cost of equity:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) - \frac{V_{txa}}{E}(k_u - k_{txa}) \tag{8.3}$$

As this equation indicates, the cost of equity depends on the unlevered cost of equity plus a premium for leverage, less a reduction for the tax deductibility of debt. Note that when a company has no debt ($D = 0$) and subsequently no tax shields ($V_{txa} = 0$), k_e equals k_u. This is why k_u is referred to as the unlevered cost of equity.

Unfortunately, k_u cannot be observed directly. In fact, none of the variables on the left side of equation 8.2 can be observed directly. Only the values on the right—that is, those related to debt and equity—can be estimated using market data. Because there are so many unknowns and only one equation, we must impose additional restrictions to build an implementable relationship between k_e and k_u.

If you believe the company will manage its debt-to-value ratio to a target level (the company's debt will grow with the business), then the value of the tax shields will track the value of the operating assets. Thus, the risk of tax shields will mirror the risk of operating assets ($k_{txa} = k_u$). Setting k_{txa} equal to k_u, equation 8.3 can be simplified as follows:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) \tag{8.4}$$

The unlevered cost of equity can now be reverse engineered using the observed cost of equity, the cost of debt, and the market debt-to-equity ratio. (Appendix C shows some alternative versions for deriving k_u from k_e.)

Although we believe the prior equation is the most useful in practice, other levering and unlevering equations are common. For instance, if the cost of the tax shields and cost of debt are risk free, and the value of debt is constant in dollar terms, equation 8.3 simplifies to:

$$k_e = k_u + (1 - T_m)\frac{D}{E}(k_u - k_d) \tag{8.5}$$

Valuing Tax Shields and Other Capital Structure Effects

To complete an APV valuation, forecast and discount capital structure side effects such as tax shields, security issue costs, and distress costs. Since UPS has only a small probability of default, we estimated the company's future interest tax shields using the company's promised yield to maturity and marginal tax rate (see Exhibit 8.15). To calculate the expected interest payment in 2014, multiply the prior year's net debt of \$17.6 billion by the expected yield of 4.9 percent (net debt equals reported debt plus after-tax unfunded pension liabilities and capitalized operating leases minus excess cash). This results in an expected interest payment of \$856 million. Next, multiply the expected interest payment by the marginal tax rate of 37.1 percent, for an expected interest tax shield of \$317 million in 2014. To determine the continuing value of interest tax shields beyond 2023, use a growth perpetuity based on 2024 interest tax shields, the unlevered cost of capital, and growth in NOPLAT.

For companies with significant leverage, the company may not be able to fully use the tax shields (it may not have enough profits to shield). If there is a significant probability of default, you must model expected tax shields, rather than the tax shields based on promised interest payments. To do this, reduce each promised tax shield by the cumulative probability of default.

EXHIBIT 8.15 **UPS: Forecast of Interest Tax Shields**

Forecast year	Prior-year net debt, $ million	Expected interest rate, %	Interest payment, $ million	Marginal tax rate, %	Interest tax shield, $ million
2014	17,619	4.9	856	37.1	317
2015	17,803	4.9	864	37.1	321
2016	18,611	4.9	904	37.1	335
2017	19,424	4.9	943	37.1	350
2018	20,245	4.9	983	37.1	365
2019	21,065	4.9	1,023	37.1	379
2020	21,889	4.9	1,063	37.1	394
2021	22,712	4.9	1,103	37.1	409
2022	23,529	4.9	1,143	37.1	424
2023	24,349	4.9	1,182	37.1	439
Continuing-value forecast	25,170	4.9	1,222	37.1	453

CAPITAL CASH FLOW MODEL

When a company actively manages its capital structure to a target debt-to-value level, both free cash flow (FCF) and the interest tax shield (ITS) should be discounted at the unlevered cost of equity, k_u, such that enterprise value equals:

$$V = \sum_{t=1}^{\infty} \frac{\text{FCF}_t}{(1+k_u)^t} + \sum_{t=1}^{\infty} \frac{\text{ITS}_t}{(1+k_u)^t}$$

In 2002, Richard Ruback of the Harvard Business School argued that there is no need to separate free cash flow from tax shields when both flows are discounted by the same cost of capital.[14] He combined the two flows and named the resulting cash flow (i.e., FCF plus interest tax shields) capital cash flow (CCF):

$$V = \text{PV(Capital Cash Flow)} = \sum_{t=1}^{\infty} \frac{\text{FCF}_t + \text{ITS}_t}{(1+k_u)^t}$$

Given that Ruback's assumptions match those of the weighted average cost of capital, the capital cash flow and WACC-based valuations will lead to identical results. In fact, we now have detailed three distinct but identical valuation methods created solely around how they treat tax shields: WACC (tax shield valued in the cost of capital), APV (tax shield valued separately), and CCF (tax shield valued in the cash flow).

Although FCF and CCF lead to the same result when debt is proportional to value, we believe free cash flow models are superior to capital cash flow

[14]R. S. Ruback, "Capital Cash Flows: A Simple Approach to Valuing Risky Cash Flows," *Financial Management* (Summer 2002): 85–103.

models. By keeping NOPLAT and FCF independent of leverage, it is possible to cleanly evaluate the company's operating performance over time and across competitors. A clean measure of historical operating performance leads to better forecasts.

CASH-FLOW-TO-EQUITY VALUATION MODEL

Each of the preceding valuation models determined the value of equity indirectly by subtracting debt and other nonequity claims from enterprise value. The equity cash flow model values equity directly by discounting cash flows to equity (CFE) at the cost of equity, rather than at the weighted average cost of capital.[15]

Exhibit 8.16 details the cash flow to equity for UPS. Cash flow to equity starts with net income. Next, add back noncash expenses, and subtract investments in working capital, fixed assets, and nonoperating assets. Finally, add any increases in debt and other nonequity claims, and subtract decreases in debt and other nonequity claims.[16] Alternatively, you can compute cash flow to equity as dividends plus share repurchases minus new equity issues. The two methods generate identical results.[17]

To value UPS using cash flow to equity holders, discount projected equity cash flows at the cost of equity (see Exhibit 8.17). Unlike enterprise-based models, this method makes no adjustments to the DCF value for nonoperating assets, debt, or capitalized operating leases. Rather, they are embedded as part of the equity cash flow.

Once again, note how the valuation, derived using equity cash flows, matches each of the prior valuations. This occurs because we have modeled

[15]The equity method can be difficult to implement correctly because capital structure is embedded in the cash flow, so forecasting is difficult. For companies whose operations are related to financing, such as financial institutions, the equity method is appropriate. Chapter 34 discusses valuing financial institutions.

[16]Exhibit 8.16 groups line items into invested capital, nonoperating assets, and debt and debt equivalents for easier comparison with Exhibit 8.6. Some line items, such as the pension account, will differ between exhibits because the line item will be embedded in net income in the cash-flow-to-equity model.

[17]When performing a stand-alone equity cash flow valuation, calculate the continuing value using an equity-based variant of the key value driver formula:

$$V_e = \frac{\text{Net Income}\left(1 - \frac{g}{\text{ROE}}\right)}{k_e - g}$$

To tie the free cash flow and equity cash flow valuation models, you must convert free cash flow continuing-value inputs into equity cash flow inputs. We did this using the following equation:

$$\text{Net Income}\left(1 - \frac{g}{\text{ROE}}\right) = \frac{\text{NOPLAT}\left(1 - \frac{g}{\text{ROIC}}\right)}{1 + \frac{D}{E}\left[1 - \frac{k_e - (1-T)k_d}{k_e - g}\right]}$$

EXHIBIT 8.16 **UPS: Equity Cash Flow Summary**

$ million

	Historical			Forecast			
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	
Net income	3,804	807	4,372	4,415	5,065	5,510	
Depreciation	1,554	1,614	1,682	1,688	1,773	1,884	
Amortization	228	244	185	228	238	252	
Gross cash flow	5,586	2,665	6,239	6,332	7,076	7,646	
Decrease (increase) in operating working capital	92	401	71	(82)	(109)	(113)	
Capital expenditures, net of disposals	(1,788)	(1,887)	(1,749)	(2,586)	(2,958)	(3,121)	
Investments in capitalized software	(229)	(243)	(273)	(234)	(253)	(268)	
Investments in goodwill and acquired intangibles	(5)	(91)	(101)	–	–	–	Invested capital
Decrease (increase) in other assets, net other liabilities	(470)	(112)	36	49	65	68	
Foreign-currency translation	(92)	294	(260)	–	–	–	
Decrease (increase) in excess cash	(129)	(3,629)	(2,698)	(186)	(196)	(198)	
Decrease (increase) in investments	458	271	53	(7)	(10)	(10)	
Decrease (increase) in deferred gains	–	–	–	–	–	–	Nonoperating assets
Decrease (increase) in deferred tax assets, net liabilities	60	(2,385)	1,681	139	158	172	
Cash flow hedges	35	(82)	67	–	–	–	
Increase (decrease) in short-term debt	(322)	1,748	(1,733)	1	2	2	
Increase (decrease) in long-term debt	604	(6)	(265)	(301)	601	579	Dept and debt equivalents
Increase (decrease) in pension liabilities, less assets[1]	475	5,987	(953)	–	–	–	
Cash flow to equity holders	4,275	2,931	5,511	3,123	4,377	4,757	
Cash dividends	2,086	2,243	2,367	2,390	2,775	3,019	
Repurchased (issued) shares	2,194	695	3,078	733	1,602	1,738	Reconciliation of cash flow to equity
Decrease (increase) in noncontrolling interests	(5)	(7)	66	–	–	–	
Cash flow to equity holders	4,275	2,931	5,511	3,123	4,377	4,757	

[1] Increase (decrease) in pension liabilities, unrecognized pension liabilities, less pension assets.

UPS's debt-to-value ratio at a constant level. If leverage is expected to change, the cost of equity must be appropriately adjusted to reflect the change in risk imposed on equity holders. Although formulas exist to adjust the cost of equity (as done in the APV section earlier in this chapter), many of the best-known formulas are built under restrictions that may be inconsistent with the way you are implicitly forecasting the company's capital structure via the cash flows. This will cause a mismatch between cash flows and the cost of equity, resulting in an incorrect valuation.

It is quite easy to change the company's capital structure without realizing it when using the cash-flow-to-equity model—and that is what makes implementing the equity model so risky. Suppose you plan to value a company whose debt-to-value ratio is 15 percent. You believe the company will pay extra dividends, so you increase debt to raise the dividend payout ratio.

EXHIBIT 8.17 **UPS: Cash-Flow-to-Equity Valuation**

Forecast year	Cash flow to equity, $ million	Discount factor, @ 8.9%	Present value of CFE, $ million
2014	3,123	0.919	2,869
2015	4,377	0.844	3,693
2016	4,757	0.775	3,687
2017	5,124	0.712	3,648
2018	5,545	0.654	3,627
2019	5,934	0.601	3,565
2020	6,355	0.552	3,507
2021	6,809	0.507	3,452
2022	7,198	0.466	3,352
2023	7,611	0.428	3,256
Continuing value	143,315	0.428	61,304
Present value of equity cash flows			95,959
Midyear adjustment amount			4,445
Less: Value of noncontrolling interest			(14)
Equity value			100,390

Presto! Increased dividends lead to higher equity cash flows and a higher valuation. Even though operating performance has not changed, the equity value has mistakenly increased. What happened? Using new debt to pay dividends causes a rise in net debt to value. Unless you adjust the cost of equity, the valuation will rise incorrectly.

A second shortcoming of the equity cash flow model is it values nonoperating assets. Imagine a company that holds a significant amount of low-risk, low-return excess cash. Since operating and nonoperating cash flows are combined together, they will both be discounted at the same rate, the cost of equity. Since the cost of equity exceeds the rate of return, it appears as if the nonoperating asset is destroying value, and the asset will be incorrectly valued below its book value, even if the asset in actuality is earning a fair rate of return. In fact, to match the equity cash flow model to the enterprise DCF model for UPS, we had to assume that nonoperating assets will generate returns equal to the cost of equity, which isn't consistent with the company's historical results.

A third shortcoming of the direct equity approach emerges when valuing a company by business unit. The direct equity approach requires allocating debt and interest expense to each unit. This creates extra work yet provides few additional insights.

One situation where the equity cash flow model leads to the simplest implementation is the analysis and valuation of financial institutions. Since capital structure is a critical part of operations in a financial institution, using enterprise DCF to separate operations and capital structure requires unnecessary assumptions. Chapter 34 uses the cash-flow-to-equity model to value banks and other financial institutions.

OTHER APPROACHES TO DISCOUNTED CASH FLOW

In this chapter, we valued UPS by discounting nominal cash flows at a nominal cost of capital. An alternative is to value companies by projecting cash flow in real terms (e.g., in constant 2014 dollars) and discounting this cash flow at a real discount rate (e.g., the nominal rate less expected inflation). But most managers think in terms of nominal rather than real measures, so nominal measures are often easier to communicate. In addition, interest rates are generally quoted nominally rather than in real terms (excluding expected inflation).

A second difficulty occurs when calculating and interpreting ROIC. The historical statements are nominal, so historical returns on invested capital are nominal. But if the projections for the company use real rather than nominal forecasts, returns on new capital are also real. Projected returns on total capital (new and old) are a combination of nominal and real, so they are impossible to interpret. The only way around this is to restate historical performance on a real basis—a complex and time-consuming task. The extra insights gained rarely equal the effort, except in extremely high-inflation environments, described in Chapter 22.

A second alternative to the enterprise DCF method outlined earlier is to discount pretax cash flows by a pretax hurdle rate (the market-based cost of capital multiplied by 1 plus the marginal tax rate) to determine a pretax value. This method, however, leads to three fundamental inconsistencies. First, the government calculates taxes on profits after depreciation, not on cash flow after capital expenditures. By discounting pretax cash flow at the pretax cost of capital, you implicitly assume capital investments are tax deductible when made, not as they are depreciated. Furthermore, short-term investments, such as accounts receivable and inventory, are never tax deductible. Selling a product at a profit is what leads to incremental taxes, not holding inventory. By discounting pretax cash flow at the pretax cost of capital, you incorrectly assume that investments in operating working capital are tax deductible. Finally, it can be shown that even when net investment equals depreciation, the final result will be downward biased—and the larger the cost of capital, the larger the bias. This bias occurs because the method is only an approximation, not a formal mathematical relationship. Because of these inconsistencies, we recommend against discounting pretax cash flows at a pretax hurdle rate.

ALTERNATIVES TO DISCOUNTED CASH FLOW

To this point, the chapter has focused solely on discounted cash flow models. Two additional valuation techniques are using multiples of comparable companies and real options.

Multiples

One simple way that investors and executives value companies is to value the company in relation to the value of other companies, similar to the way a real estate agent values a house by comparing it with similar houses that have recently sold. To do this, first calculate how similar companies are valued as a multiple of a relevant metric, such as earnings, invested capital, or an operating metric like barrels of oil reserves. You can then apply that multiple to the company you are valuing. For example, assume the company's NOPLAT equals $100 million and the typical enterprise-value-to-NOPLAT multiple for companies in the industry with similar growth and ROIC prospects is 13 times. Multiplying 13 by $100 million leads to an estimated value of $1.3 billion.

Multiples can be a great check on your DCF valuation if done properly. Suppose the value estimated by multiples is $1.3 billion, but your DCF value is $1.7 billion. This might be a clue that there is something wrong with your DCF valuation model. It could be that the company you are valuing is expected to perform differently than the comparable companies. Finally, it could be that investors have a different outlook for the entire industry than you do (in which case the multiples of all the comparable companies would be out of line with their DCF value). Of course, it could just be that your multiples valuation wasn't performed properly. Because of their broad use and potential for error, we devote Chapter 16 to valuation using multiples.

In a nutshell, to use multiples properly, you need to carefully choose the multiple and the comparable companies. In the case of earnings multiples, we recommend using ratios of enterprise value to NOPLAT rather than price to earnings or enterprise value to EBITDA. We also urge you to be careful when choosing the comparable companies. Not only should the comparable companies be in the same industry, but they should also have similar performance, as measured by ROIC and growth.

Real Options

In 1997, Robert Merton and Myron Scholes won the Nobel Prize in economics for developing an ingenious method to value derivatives that avoids the need to estimate either cash flows or the cost of capital.[18] Their model relies on what today's economists call a "replicating portfolio." They argued that if a portfolio exists of traded securities whose future cash flows perfectly mimic the security you are attempting to value, the portfolio and security must have the same price. As long as you can find a suitable replicating portfolio, you need not discount future cash flows.

[18]Fischer Black would have been named as a third recipient, but the Nobel Prize is not awarded posthumously.

Given the model's power in valuing derivatives like stock options, there have been many recent attempts to translate the concepts of replicating portfolios to corporate valuation. This valuation technique, commonly known as real options, is especially useful in situations of great uncertainty. Unlike those for financial options, however, replicating portfolios for companies and their projects are difficult to create. Therefore, although option-pricing models may teach powerful lessons, today's applications are limited. Chapter 35 covers valuation using options-based models.

SUMMARY

This chapter has explored the most common DCF valuation models, with particular focus on the enterprise DCF model and the economic-profit model. Each model has its own rationale, and each has an important place in corporate valuation. The remaining chapters in Part Two describe a step-by-step approach to valuing a company. These chapters explain the technical details of valuation, including how to reorganize the financial statements, analyze return on invested capital and revenue growth, forecast free cash flow, compute the cost of capital, and estimate an appropriate terminal value.

9

Reorganizing the Financial Statements

Traditional financial statements—the income statement, balance sheet, and statement of cash flows—do not promote easy insights into operating performance and value. They simply aren't organized that way. The balance sheet mixes together operating assets, nonoperating assets, and sources of financing. The income statement similarly combines operating profits, interest expense, the amortization of acquired intangible assets, and other nonoperating items.

To prepare the financial statements for analyzing economic performance, you need to reorganize the items on the balance sheet, income statement, and statement of cash flows into three categories: operating items, nonoperating items, and sources of financing. This often requires searching through the notes to separate accounts that aggregate operating and nonoperating items. Although this task seems mundane, it is crucial for avoiding the common traps of double-counting, omitting cash flows, and hiding leverage that artificially boosts reported performance.

Since the process of reorganizing the financial statements is complex, this chapter proceeds in three steps. Step 1 presents a simple example demonstrating how to build invested capital, net operating profit less adjusted taxes (NOPLAT), and free cash flow (FCF). The second step applies this method to the financial statements for UPS and FedEx, with comments on some of the intricacies of implementation. The final step provides a brief summary of advanced analytical topics, including how to adjust for operating leases, pensions, capitalized expenses, and restructuring charges. An in-depth analysis of each of these topics can be found in Part Three.

REORGANIZING THE ACCOUNTING STATEMENTS: KEY CONCEPTS

To calculate return on invested capital (ROIC) and FCF, it is necessary to reorganize the balance sheet to create invested capital and likewise reorganize the income statement to create NOPLAT. Invested capital represents the total investor capital required to fund operations, without regard to how the capital is financed. NOPLAT represents the total after-tax operating profit (generated by the company's invested capital) that is available to all investors.

ROIC and FCF are both derived from NOPLAT and invested capital. ROIC is defined as:

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Invested Capital}}$$

and free cash flow is defined as:

$$\begin{aligned}\text{FCF} = \text{NOPLAT} &+ \text{Noncash Operating Expenses} \\ &- \text{Investment in Invested Capital}\end{aligned}$$

By combining noncash operating expenses, such as depreciation, with investment in invested capital, it is also possible to express FCF as:

$$\text{FCF} = \text{NOPLAT} - \text{Net Increase in Invested Capital}$$

Invested Capital: Key Concepts

To build an economic balance sheet that separates a company's operating assets from its nonoperating assets and financial structure, we start with the traditional balance sheet. The accounting balance sheet is bound by the most fundamental rule of accounting:

$$\text{Assets} = \text{Liabilities} + \text{Equity}$$

The traditional balance sheet equation, however, mixes operating liabilities and sources of financing on the right side of the equation.

Assume a company has only operating assets (OA) such as receivables, inventory, and property, plant, and equipment (PP&E); operating liabilities (OL) such as accounts payable and accrued salaries; interest-bearing debt (D); and equity (E). Using this more explicit breakdown of assets, liabilities, and equity leads to an expanded version of the balance sheet relationship:

$$\text{Operating Assets} = \text{Operating Liabilities} + \text{Debt} + \text{Equity}$$

Moving operating liabilities to the left side of the equation leads to invested capital:

$$\text{Operating Assets} - \text{Operating Liabilities} = \text{Invested Capital} = \text{Debt} + \text{Equity}$$

With this new equation, we have rearranged the balance sheet to more accurately reflect capital used for operations and the financing provided by investors to fund those operations. Note how invested capital can be calculated using either the operating method (that is, operating assets minus operating liabilities) or the financing method (debt plus equity).

For many companies, the previous equation is too simple. Assets consist of not only operating assets, but also nonoperating assets (NOA), such as marketable securities, prepaid pension assets, nonconsolidated subsidiaries, and other long-term investments. Liabilities consist of not only operating liabilities and interest-bearing debt, but also debt equivalents (DE), such as unfunded retirement liabilities, and equity equivalents (EE), such as deferred taxes and income-smoothing provisions (we explain equivalents in detail later in the chapter). We can expand our original balance sheet equation to show these:

$$\begin{array}{ccccccccc} \text{OA} & & \text{NOA} & & \text{OL} & & \text{D + DE} & & \text{E + EE} \\ \text{Operating} & + & \text{Nonoperating} & = & \text{Operating} & + & \text{Debt and} & + & \text{Equity and} \\ \text{Assets} & & \text{Assets} & & \text{Liabilities} & & \text{Its Equivalents} & & \text{Its Equivalents} \end{array}$$

Rearranging leads to total funds invested:

$$\begin{array}{ccccccccc} \text{OA} - \text{OL} & & \text{NOA} & & \text{Total} & & \text{D + DE} & & \text{E + EE} \\ \text{Invested} & + & \text{Nonoperating} & = & \text{Funds} & = & \text{Debt and} & + & \text{Equity and} \\ \text{Capital} & & \text{Assets} & & \text{Invested} & & \text{Its Equivalents} & & \text{Its Equivalents} \end{array}$$

From an investing perspective, total funds invested equals invested capital plus nonoperating assets. From the financing perspective, total funds invested equals debt and its equivalents plus equity and its equivalents. Exhibit 9.1 rearranges the balance sheet into invested capital for a simple hypothetical company with only a few line items. Note how the amount of total funds invested is identical regardless of the method used.

Net Operating Profit Less Adjusted Taxes: Key Concepts

NOPLAT is the after-tax profit generated from core operations, excluding any income from nonoperating assets or financing expenses, such as interest. Whereas net income is the profit available to equity holders only, NOPLAT is the profit available to *all* investors, including providers of debt, equity, and any other types of financing. It is critical to define NOPLAT consistently with your definition of invested capital and to include only those profits generated by invested capital. To calculate NOPLAT, we reorganize the accounting income statement (see Exhibit 9.2) in three ways. First, interest is not subtracted from operating profit, because interest is a payment to the company's investors, not an operating expense. By reclassifying interest as a financing item, we make NOPLAT independent of the company's capital structure.

EXHIBIT 9.1 **An Example of Invested Capital**

$ million

Accountant's balance sheet

	Prior year	Current year
Assets		
Cash	5	15
Inventory	200	225
Net PP&E	300	350
Equity investments	15	25
Total assets	520	615
Liabilities and equity		
Accounts payable	125	150
Interest-bearing debt	225	200
Retained earnings	170	265
Total liabilities and equity	520	615

Invested capital

	Prior year	Current year	
Assets			
Cash	5	15	
Inventory	200	225	Operating liabilities are netted against operating assets.
Accounts payable	(125)	(150)	
Operating working capital	80	90	
Net PP&E	300	350	
Invested capital	380	440	
Equity investments	15	25	Nonoperating assets are not included in invested capital.
Total funds invested	395	465	
Reconciliation of total funds invested			
Interest-bearing debt	225	200	
Retained earnings	170	265	
Total funds invested	395	465	

Second, when calculating after-tax operating profit, exclude any nonoperating income generated from assets that were excluded from invested capital. Mistakenly including nonoperating income in NOPLAT without including the associated assets in invested capital will lead to an inconsistent definition of ROIC (the numerator and denominator will include unrelated elements).

Finally, since reported taxes are calculated after interest and nonoperating income, they are a function of nonoperating items and capital structure. Keeping NOPLAT focused solely on operations requires that the effects of interest expense and nonoperating income also be removed from taxes. To calculate operating taxes, start with reported taxes, add back the tax shield from interest expense, and remove the taxes paid on nonoperating income. The resulting operating taxes should equal the hypothetical taxes that would be reported by an all-equity, pure operating company. Nonoperating taxes, the difference between operating taxes and reported taxes, are not included in NOPLAT, but instead as part of income available to investors.

Free Cash Flow: Key Concepts

To value a company's operations, we discount projected free cash flow at a company's weighted average cost of capital. Free cash flow is the after-tax cash flow available to all investors: debt holders and equity holders. Unlike "cash flow from operations" reported in a company's annual report, free cash flow is independent of financing and nonoperating items. It can be thought of as

EXHIBIT 9.2 **An Example of NOPLAT**

$ million

Accountant's income statement

	Current year
Revenues	1,000
Operating costs	(700)
Depreciation	(20)
Operating profit	280
Interest expense	(20)
Equity income	4
Earnings before taxes (EBT)	264
Taxes	(66)
Net income	198

NOPLAT

	Current year	
Revenues	1,000	
Operating costs	(700)	
Depreciation	(20)	
EBITA	280	
Operating taxes[1]	(70)	← Taxes are calculated on operating profits.
NOPLAT	210	
Equity income	4	← Do not include income from any asset excluded from invested capital as NOPLAT.
Nonoperating taxes[2]	4	
Income available to investors	218	
Reconciliation with net income		
Net income	198	← Treat interest as a financial payout to investors, not an operating expense.
Interest expense	20	
Income available to investors	218	

[1] Assumes a marginal tax of 25% on all income.
[2] Interest tax shield less taxes on equity income.

the after-tax cash flow—as if the company held only core operating assets and financed the business entirely with equity. Free cash flow is defined as:

$$\text{FCF} = \text{NOPLAT} + \text{Noncash Operating Expenses}$$
$$- \text{Investments in Invested Capital}$$

As shown in Exhibit 9.3, free cash flow excludes nonoperating flows and items related to capital structure. Unlike the accounting cash flow statement, the free cash flow statement starts with NOPLAT (instead of net income). As discussed earlier, NOPLAT excludes nonoperating income and interest expense. Instead, interest is treated as a financing cash flow.

Net investments in nonoperating assets and the gains, losses, and income associated with these nonoperating assets are not included in free cash flow. Instead, nonoperating cash flows should be valued separately. Combining free cash flow and nonoperating cash flow leads to cash flow available to investors. As is true with total funds invested and NOPLAT, cash flow available to investors can be calculated using two methodologies: one starts from where the cash flow is generated, and the other starts with the recipients of the cash flow. Although the two methods seem redundant, checking that both give the same result can help avoid line item omissions and classification pitfalls.

EXHIBIT 9.3 **An Example of Free Cash Flow**

$ million

Accountant's cash flow statement

	Current year
Net income	198
Depreciation	20
Decrease (increase) in inventory	(25)
Increase (decrease) in accounts payable	25
Cash flow from operations	218
Capital expenditures	(70)
Decrease (increase) in equity investments	(10)
Cash flow from investing	(80)
Increase (decrease) in interest-bearing debt	(25)
Dividends	(103)
Cash flow from financing	(128)
Starting cash	5
Change in cash	10
Ending cash	15

Free cash flow

	Current year	
NOPLAT	210	
Depreciation	20	
Gross cash flow	230	
Decrease (increase) in operating cash	(10)	
Decrease (increase) in inventory	(25)	Subtract investments in operating items from gross cash flow.
Increase (decrease) in accounts payable	25	
Capital expenditures	(70)	
Free cash flow	150	
Nonoperating income	4	Evaluate cash flow from nonoperating assets separately from core operations.
Nonoperating taxes	4	
Decrease (increase) in equity investments	(10)	
Cash flow available to investors	148	
Reconciliation of cash flow available to investors		
Interest expense	20	Treat interest as a financial payout to investors, not an expense.
Increase (decrease) in interest-bearing debt	25	
Dividends	103	
Cash flow available to investors	148	

REORGANIZING THE ACCOUNTING STATEMENTS: IN PRACTICE

Reorganizing the statements can be difficult, even for the savviest analyst. Which items are operating assets? Which are nonoperating? Which items should be treated as debt? As equity?

In the following pages, we examine today's complex accounting through an examination of the global shipping giant United Parcel Service (UPS), and comparison with FedEx, a direct competitor. UPS struggled during the financial crisis of 2007–2009 but has since improved its performance to pre-crisis levels. FedEx also witnessed declines during the financial crisis but has not yet matched UPS's return on invested capital. This chapter sets the stage for analyzing the two companies by reorganizing their financial statements into operating, nonoperating, and financial items.

Invested Capital: In Practice

To compute invested capital, we reorganize the company's balance sheet. Exhibit 9.4 presents expanded balance sheets for UPS and FedEx. The reorganized versions presented are more detailed than the balance sheets reported in

EXHIBIT 9.4 **UPS and FedEx: Historical Balance Sheet**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Assets						
Cash and marketable securities	4,275	7,924	5,245	2,843	4,917	2,908
Accounts receivable, net	6,246	6,111	6,502	4,704	5,044	5,460
Deferred income tax assets	611	583	684	533	533	522
Other current assets	1,152	973	956	976	780	793
Total current assets	12,284	15,591	13,387	9,056	11,274	9,683
Net PP&E	17,621	17,894	17,961	17,248	18,484	19,550
Goodwill	2,101	2,173	2,190	2,387	2,755	2,790
Other intangible assets, acquired[1]	197	188	252	34	72	57
Other intangible assets, capitalized software	388	415	523	–	–	–
Restricted cash	286	288	425	–	–	–
Investments[2]	472	201	148	–	–	–
Deferred income tax assets	118	684	110	–	–	80
Postretirement benefit assets[3]	1	26	47	–	–	–
Other noncurrent assets	1,233	1,403	1,169	1,178	982	910
Total assets	34,701	38,863	36,212	29,903	33,567	33,070
Liabilities and equity						
Short-term debt	33	1,781	48	417	251	1
Accounts payable	2,300	2,278	2,478	1,613	1,879	1,971
Accrued wages and withholdings	1,843	1,927	2,325	1,635	1,688	1,277
Self-insurance reserves	781	763	719	678	796	811
Deferred income tax liabilities[4]	31	36	48	–	–	–
Postretirement benefit obligations[4]	109	125	116	–	–	–
Other current liabilities	1,417	1,480	1,397	1,031	1,136	1,252
Total current liabilities	6,514	8,390	7,131	5,374	5,750	5,312
Long-term debt	11,095	11,089	10,824	1,250	2,739	4,736
Self-insurance reserves	1,806	1,980	2,059	963	987	1,038
Deferred income tax liabilities	1,900	48	1,244	836	1,652	2,114
Postretirement benefit obligations	5,505	11,964	7,947	5,582	3,916	3,484
Deferred gains, aircraft sale/leaseback	–	–	–	252	227	206
Other noncurrent liabilities	773	659	519	920	898	903
Total liabilities	27,593	34,130	29,724	15,176	16,169	17,793
Common stock and paid-in capital	10	10	9	2,627	2,700	2,675
Retained earnings	10,128	7,997	6,925	17,134	18,519	20,429
Accumulated other comprehensive loss	(3,103)	(3,354)	(460)	(4,953)	(3,820)	(3,694)
Deferred compensation less treasury stock	–	–	–	(81)	(1)	(4,133)
Noncontrolling interests	73	80	14	0	0	0
Shareholders' equity	7,108	4,733	6,488	14,727	17,398	15,277
Liabilities and shareholders' equity	34,701	38,863	36,212	29,903	33,567	33,070

[1] Includes acquired trademarks, licenses, patents, customer lists, and franchise rights.
[2] A portion of this account ("other investments" in UPS 10-K) was originally consolidated in other noncurrent assets.
[3] This account was originally consolidated in other noncurrent assets.
[4] This account was originally consolidated in other current liabilities.

each company's annual reports, because we have searched the annual report's footnotes for information that enables the disaggregation of any accounts that mix together operating and nonoperating items. For instance, UPS's 2013 notes reveal that the company aggregates investment in partnerships and postretirement benefits within the "other assets" line item.[1] Since "other assets" combines operating and nonoperating items, the balance sheet in its original form would be unusable for valuation purposes.

Invested capital sums operating working capital (current operating assets minus current operating liabilities); fixed assets (net property, plant, and equipment); net other long-term operating assets (net of long-term operating liabilities); and, when appropriate, intangible assets (goodwill, acquired intangibles, and capitalized software). Exhibit 9.5 demonstrates this line-by-line aggregation for UPS and FedEx. In the following subsections, we examine each element in detail.

Operating working capital Operating working capital equals operating current assets minus operating current liabilities. Operating current assets comprise all current assets necessary for the operation of the business, including working cash balances, trade accounts receivable, inventory, and prepaid expenses. Specifically *excluded* are excess cash and marketable securities—that is, cash greater than the operating needs of the business. Excess cash generally represents temporary imbalances in the company's cash position. We discuss this later in this section.[2]

Operating current liabilities include those liabilities that are related to the ongoing operations of the firm. The most common operating liabilities are those related to suppliers (accounts payable), employees (accrued salaries), customers (as either prepayments or deferred revenue), and the government (income taxes payable).[3] If a liability is deemed operating rather than financial, it should be netted from operating assets to determine invested capital and consequently incorporated into free cash flow. Interest-bearing liabilities are nonoperating and should *not* be netted from operating assets, but rather valued separately.

Some argue that operating liabilities, such as accounts payable, are a form of financing and should be treated no differently than debt. However, this

[1]Investments in partnerships totaling $129 million can be found in UPS's 2013 10-K, note 2. This amount has been added to the $19 million variable life insurance policy also found in note 2, and aggregated into a single account we label "Investments." UPS also aggregates prepaid pension expenses in other assets, of which $47 million can be found in the funded status table of UPS's 2013 10-K, note 4.

[2]In a company's financial statements, accountants often distinguish between cash and marketable securities, but not between working cash and excess cash. We provide guidance on distinguishing working cash from excess cash later in this chapter.

[3]Shippers such as UPS and FedEx receive customer prepayments from, among other things, anticipated lost packages (for which customer funds are received but revenue is not recognized until delivery is successful).

EXHIBIT 9.5 **UPS and FedEx: Invested-Capital Calculation**

$ million

	UPS			FedEx		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
Total funds invested: uses						
Operating cash	1,062	1,083	1,109	854	886	911
Accounts receivable, net	6,246	6,111	6,502	4,704	5,044	5,460
Other current assets	1,152	973	956	976	780	793
Operating current assets	8,460	8,167	8,567	6,534	6,710	7,164
Accounts payable	(2,300)	(2,278)	(2,478)	(1,613)	(1,879)	(1,971)
Accrued wages and withholdings	(1,843)	(1,927)	(2,325)	(1,635)	(1,688)	(1,277)
Self-insurance reserves	(781)	(763)	(719)	(678)	(796)	(811)
Other current liabilities	(1,417)	(1,480)	(1,397)	(1,031)	(1,136)	(1,252)
Operating current liabilities	(6,341)	(6,448)	(6,919)	(4,957)	(5,499)	(5,311)
Operating working capital	2,119	1,719	1,648	1,577	1,211	1,853
Net PP&E	17,621	17,894	17,961	17,248	18,484	19,550
Capitalized operating leases[1]	5,684	5,428	5,841	20,688	22,195	23,427
Intangible assets, capitalized software	388	415	523	–	–	–
Other operating assets, net other liabilities[2]	(1,060)	(948)	(984)	(705)	(903)	(1,031)
Invested capital (excluding goodwill)	24,752	24,508	24,989	38,808	40,987	43,799
Goodwill and acquired intangibles, less tax gross-up[3]	2,225	2,295	2,349	2,408	2,800	2,826
Cumulative amortization and impairment[3]	636	655	667	2,026	2,043	2,057
Invested capital (including goodwill)	27,614	27,458	28,004	43,242	45,830	48,682
Excess cash	3,213	6,841	4,136	1,989	4,031	1,997
Investments	472	201	148	–	–	–
Postretirement benefit assets	1	26	47	–	–	–
Total funds invested	31,300	34,526	32,336	45,231	49,861	50,679
Total funds invested: sources						
Short-term debt	33	1,781	48	417	251	1
Long-term debt	11,095	11,089	10,824	1,250	2,739	4,736
Capitalized operating leases[1]	5,684	5,428	5,841	20,688	22,195	23,427
Postretirement benefit liabilities	5,614	12,089	8,063	5,582	3,916	3,484
Debt and debt equivalents	22,426	30,387	24,776	27,937	29,101	31,648
Deferred gains, aircraft sale/leaseback	–	–	–	251	227	206
Deferred tax liabilities (assets), operating[4]	3,235	3,359	3,491	2,684	2,948	3,032
Deferred tax liabilities (assets), nonoperating[4]	(2,106)	(4,608)	(3,086)	(2,394)	(1,856)	(1,541)
Cumulative amortization and impairment[3]	636	655	667	2,026	2,043	2,057
Shareholders' equity	7,108	4,733	6,488	14,727	17,398	15,277
Equity and equity equivalents	8,874	4,139	7,560	17,294	20,760	19,031
Total funds invested	31,300	34,526	32,336	45,231	49,861	50,679

[1] Capitalized operating lease adjustments are detailed in Exhibit 9.15.
[2] Restricted cash and other noncurrent assets, less self-insurance reserves and other noncurrent liabilities.
[3] Goodwill and cumulative amortization adjustments are detailed in Exhibit 9.6.
[4] Deferred tax adjustments are detailed in Exhibit 9.8.

would lead to an inconsistent definition of NOPLAT and invested capital. NOPLAT is the income available to both debt and equity holders, so when you are determining ROIC, you should divide NOPLAT by debt plus equity. Although a supplier may charge customers implicit interest for the right to pay in 30 days, the charge is an indistinguishable part of the price, and hence an indistinguishable part of the cost of goods sold. Since cost of goods sold is subtracted from revenue to determine NOPLAT, operating liabilities must be subtracted from operating assets to determine invested capital. A theoretical but cumbersome alternative would be to treat accounts payable as debt and adjust NOPLAT for the implicit interest cost.

Net property, plant, equipment, and other capitalized investments The book value of net property, plant, and equipment (e.g., production equipment and facilities) is always included in operating assets. Situations that require using the market value or replacement cost are discussed in Chapter 10.

Some companies, such as UPS, have significant investments in software. Under certain restrictions, these investments can be capitalized on the balance sheet rather than immediately expensed. Although it is labeled as an intangible asset, treat capitalized software no differently than property and equipment; treat amortization as if it were depreciation; and treat investments in capitalized software as if they were capital expenditures.[4] Only internally generated intangible assets, however, should be treated in this manner. Acquired intangibles require special care and are discussed separately.

Other operating assets, net liabilities If other long-term assets and liabilities are small—and not detailed by the company—we typically assume they are operating. To determine net other long-term operating assets, subtract other long-term liabilities from other long-term assets. This figure should be included as part of invested capital. If, however, other long-term assets and liabilities are relatively large, you will need to disaggregate each account into its operating and nonoperating components before you can calculate net other long-term operating assets.

For instance, a relatively large other long-term assets account might include nonoperating items such as deferred tax assets, prepaid pension assets, nonconsolidated subsidiaries, and other equity investments. Nonoperating items should not be included in invested capital.[5] Long-term liabilities might similarly include operating and nonoperating items. Operating liabilities are liabilities that result directly from an ongoing operating activity. For instance, UPS warranties some services beyond one year, collecting customer funds today but recognizing the revenue (and resulting income) only gradually over the warranty period. However, most long-term liabilities are not operating liabilities, but rather what we deem debt and equity equivalents. These include

[4]The cash flow statement in the UPS annual report combines investment in property and equipment with investments in software within capital expenditures. Attributing reported capitalized expenditures entirely to PP&E would overstate the actual investment.

[5]Classifying assets as operating or nonoperating requires judgment. For instance, we classify restricted cash as an operating asset because cash must be set aside in order for UPS to secure third-party guarantees on self-insurance. As the business grows, UPS will need to set aside additional restricted cash, and hence the asset will grow with operations.

unfunded pension liabilities, unfunded postretirement medical costs, restructuring reserves, and deferred taxes.

Where can you find the breakdown of other assets and other liabilities? In some cases, companies provide a table in the footnotes. Most of the time, however, you must work through the footnotes, note by note, searching for items aggregated within other assets and liabilities. For instance, in 2013 UPS aggregated an investment partnership within other assets. This was reported solely in the 2013 footnote titled "Cash and Investments." In 2012 and 2013, UPS aggregated an $896 million liability related to withdrawing from a pension plan within other noncurrent liabilities. Although the jump in other noncurrent liabilities signaled the issue, only an investigation of the footnotes pointed to the cause.

Goodwill and acquired intangibles In Chapter 10, return on invested capital is analyzed both with and without goodwill and acquired intangibles. ROIC with goodwill and acquired intangibles measures a company's ability to create value after paying acquisition premiums. ROIC without goodwill and acquired intangibles measures the competitiveness of the underlying business. For instance, Dutch brewer Heineken[6] has a better ROIC with goodwill and acquired intangibles than Danish brewer Carlsberg, but this difference is attributable to premiums Carlsberg paid to acquire breweries, not inferior operating performance. When ROIC is computed without goodwill and acquired intangibles, Carlsberg's operating performance exceeds that of Heineken. To prepare for both analyses, compute invested capital with and without goodwill and acquired intangibles.

To evaluate goodwill and acquired intangibles properly, you need to make two adjustments. First, subtract deferred tax liabilities related to the amortization of acquired intangibles. Why? When amortization is not tax deductible, the accountants create a deferred tax liability at the time of the acquisition that is drawn down over the amortization period (since reported taxes will be lower than actual taxes). To counterbalance the liability, acquired intangibles are artificially increased by a corresponding amount, even though no cash was laid out. For UPS, acquired intangibles are small, so the reduction is minor. For companies with significant acquired intangibles—for example, Coca-Cola—the adjustment can be substantial.

Second, add back cumulative amortization and impairment. Unlike other fixed assets, goodwill and acquired intangibles do not wear out, nor are they replaceable. Therefore, you need to adjust reported goodwill and acquired intangibles upward to recapture historical amortization and impairments.[7] (To

[6]Chapter 24 provides a detailed valuation of Heineken. This comprehensive case includes an analysis of Heineken and its peers using ROIC both with and without goodwill (see Exhibit 24.16).

[7]The implementation of new accounting standards (in 2001 for the United States and in 2005 for Europe) radically changed the way companies account for acquisitions. Today, whether paid in cash or in stock,

EXHIBIT 9.6 **UPS and FedEx: Adjustments to Goodwill and Acquired Intangibles**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Goodwill	2,101	2,173	2,190	2,387	2,755	2,790
Acquired intangibles	197	188	252	34	72	57
Deferred tax liabilities, acquired intangibles[1]	(73)	(66)	(93)	(13)	(27)	(21)
Goodwill and acquired intangibles, less tax gross-up	2,225	2,295	2,349	2,408	2,800	2,826
Cumulative impairment of goodwill	548	548	548	1,825	1,825	1,825
Cumulative amortization of acquired intangibles	140	168	188	327	354	377
Cumulative amortization tax shield	(52)	(61)	(69)	(126)	(136)	(145)
Cumulative amortization and impairment	636	655	667	2,026	2,043	2,057
Adjusted goodwill and acquired intangibles	2,862	2,950	3,016	4,434	4,843	4,883

[1] Deferred tax adjustments are detailed in Exhibit 9.8.

maintain consistency, do not deduct amortization and impairments of goodwill and acquired intangibles from revenues to determine NOPLAT.) In Exhibit 9.6, amortization and impairments dating back to 2003 are added back to UPS and FedEx's recorded goodwill and acquired intangibles. For example, in 2007, FedEx wrote down approximately $900 million in goodwill and acquired intangibles when it converted the acquired brand name Kinko's to FedEx Office. Failing to add back this impairment would have caused a large artificial jump in return on invested capital in 2007. The money spent on the acquisition is real and needs to be accounted for, even when the investment fails to work.

Computing Total Funds Invested

Invested capital represents the capital necessary to operate a company's core business. In addition to invested capital, companies can also own nonoperating assets. Nonoperating assets include excess cash and marketable securities, receivables from financial subsidiaries (e.g., credit card receivables), nonconsolidated subsidiaries, overfunded pension assets, and tax loss carryforwards. Summing invested capital and nonoperating assets leads to total funds invested.

Excess cash and marketable securities Do not include excess cash in invested capital. By its definition, excess cash is unnecessary for core operations. Rather

acquisitions must be recorded on the balance sheet using the purchase methodology. Second, goodwill is not amortized. Instead, the company periodically tests the level of goodwill to determine whether the acquired business has lost value. If it has, goodwill is impaired (written down). Intangible assets (which differ from goodwill in that they are separable and identifiable) are amortized over the perceived life of the asset.

than mix excess cash with core operations, analyze and value excess cash separately. Given its liquidity and low risk, excess cash will earn very small returns. Failing to separate excess cash from core operations will incorrectly depress the company's apparent ROIC.

Companies do not disclose how much cash they deem necessary for operations. Nor does the accounting definition of cash versus marketable securities distinguish working cash from excess cash. Based on past analysis, companies with the smallest cash balances held cash just below 2 percent of sales. If this is a good proxy for working cash, any cash above 2 percent should be considered excess.[8] In 2013, UPS held $5.2 billion in cash and marketable securities on $55.4 billion in revenue. At 2 percent of revenue, operating cash equals just $1.1 billion. The remaining cash of $4.1 billion is treated as excess. Exhibit 9.5 separates operating cash from excess cash. Note how excess cash is not computed as part of invested capital with goodwill, but rather treated as a nonoperating asset.

Financial subsidiaries Some companies, including IBM, Siemens, and Caterpillar, have financing subsidiaries that finance customer purchases. Because these subsidiaries charge interest on financing for purchases, they resemble banks. Since bank economics are quite different from those of manufacturing companies, you should separate line items related to the financial subsidiary from the line items for the manufacturing business. Then evaluate the return on capital for each type of business separately. Otherwise, significant distortions of performance will make a meaningful comparison with competitors impossible. For more on how to analyze and assess financial subsidiaries, see Chapter 17.

Nonconsolidated subsidiaries and equity investments Nonconsolidated subsidiaries and equity investments should be measured and valued separately from invested capital. When a company owns a minority stake in another company, it will record the investment as a single line item on the balance sheet and will not record the individual assets owned by the subsidiary. On the income statement, only income from the subsidiary will be recorded on the parent's income statement, not the subsidiary's revenues or costs. Since only income and not revenue is recorded, including nonconsolidated subsidiaries as part of operations will distort margins and capital turnover. Therefore,

[8]This aggregate figure, however, is not a rule. Required cash holdings vary by industry. For instance, one study found that companies in industries with higher cash flow volatility hold higher cash balances. To assess the minimum cash needed to support operations, look for a minimum clustering of cash to revenue across the industry. For more on predictive cash balances, see T. Opler, L. Pinkowitz, R. Stulz, and R. Williamson, "The Determinants and Implications of Corporate Cash Holdings," *Journal of Financial Economics* 52, no. 1 (1999): 3–46. For more on why companies hold excess cash, see F. Foley, J. Hartzell, S. Titman, and G. Twite, "Why Do Firms Hold So Much Cash? A Tax-Based Explanation," *Journal of Financial Economics* 86, no. 3 (December 2007): 579–607.

we recommend separating nonconsolidated subsidiaries from invested capital and analyzing and valuing nonconsolidated subsidiaries separately from core operations.

Overfunded pension assets If a company runs a defined-benefit pension plan for its employees, it must fund the plan each year. And if a company funds its plan faster than its pension expenses dictate or assets grow faster than expected, under U.S. Generally Accepted Accounting Principles (GAAP) and International Accounting/Financial Reporting Standards (IAS/IFRS) the company can recognize a portion of the excess assets on the balance sheet. Pension assets are considered a nonoperating asset and not part of invested capital. Their value is important to the equity holder, so they will be valued later, but separately from core operations. Chapter 20 examines pension assets in detail.

Tax loss carryforwards Unless they are small and grow consistently with revenue, do not include tax loss carryforwards—also known as net operating losses (NOLs)—as part of invested capital. Depending on the type of carryforward, it will be valued either separately or as part of operating cash taxes. The treatment of deferred taxes is discussed in more detail in a subsequent subsection.

Other nonoperating assets Other nonoperating assets, such as derivatives, excess real estate, and discontinued operations, also should be excluded from invested capital. For UPS, derivatives were disclosed in the footnotes but are immaterial, so no adjustments were made to the balance sheet accounts. For more on derivatives, see the comprehensive case of Heineken presented in Chapter 24.

Reconciling Total Funds Invested

Total funds invested can be calculated as invested capital plus nonoperating assets, as in the previous section, or as the sum of debt, equity, and their equivalents. The totals produced by the two approaches should reconcile. A summary of sources of financing appears in Exhibit 9.7. We next examine each of these sources of capital contributing to total funds invested.

Debt Debt includes any short-term or long-term interest-bearing liability. Short-term debt includes commercial paper, notes payable, and the current portion of long-term debt. Long-term debt includes fixed debt, floating debt, and convertible debt with maturities of more than a year.

Debt equivalents such as retirement liabilities and restructuring reserves If a company's defined-benefit plan is underfunded, it must recognize the underfunding as a liability. The amount of underfunding is not an operating liability.

EXHIBIT 9.7 **Sources of Financing**

Source of capital	Description
Debt	Interest-bearing debt from banks and public capital markets.
Debt equivalents	Off-balance-sheet debt and one-time debts owed to others that are not part of ongoing operations (e.g., severance payments as part of a restructuring, an unfunded pension liability, or expected environmental remediation following a plant closure).
Hybrid securities	Claims that have equity characteristics but are not yet part of owners' equity (e.g., convertible debt and employee options).
Noncontrolling interest	External shareholder that owns a minority position in one of the company's consolidated subsidiaries.
Equity	Common stock, additional paid-in capital, retained earnings, and accumulated other comprehensive income.
Equity equivalents	Balance sheet accounts that arise because of noncash adjustments to retained earnings; similar to debt equivalents but not deducted from enterprise value to determine equity value (e.g., most deferred-tax accounts and income-smoothing provisions).

Rather, treat unfunded pension liabilities and unfunded postretirement medical liabilities as a debt equivalent (and treat the net interest expense associated with these liabilities as nonoperating). It is as if the company must borrow money to fund the plan. As an example, UPS announced in 2012 that it would withdraw from the multiemployer New England Teamsters & Trucking Industry Pension Fund. To be released from its obligations to the fund, UPS promised to pay $43 million per year for 50 years. This fixed repayment promise, an obligation with seniority to equity claims, is really no different from traditional debt.

Other debt equivalents, such as reserves for plant decommissioning and restructuring reserves, are discussed in Chapter 19.

Hybrid securities Hybrid securities are claims against enterprise value that have characteristics similar to equity but are not part of common equity. The three most common hybrid securities are convertible debt, preferred stock, and employee options. The claims should be treated similarly to debt equivalents and valued separately.

Noncontrolling interest A noncontrolling interest (formerly called a minority interest) occurs when a third party owns some percentage of one of the company's consolidated subsidiaries. If a noncontrolling interest exists, treat the balance sheet amount as an equity equivalent. Treat the earnings attributable to any noncontrolling interest as a financing cash flow similar to dividends.

Equity Equity includes original investor funds, such as common stock and additional paid-in capital, as well as investor funds reinvested into the company, such as retained earnings and accumulated other comprehensive income (OCI). In the United States, accumulated OCI consists primarily of currency adjustments, aggregate unrealized gains and losses from liquid assets whose value has changed but that have not yet been sold, and pension plan fluctuations within a certain band. IFRS also includes accumulated OCI within shareholders' equity but reports each reserve separately. Any stock repurchased and held in the treasury should be deducted from total equity.

Equity equivalents such as deferred taxes Equity equivalents are balance sheet accounts that arise because of noncash adjustments to income and retained earnings. Equity equivalents are similar to debt equivalents; they differ only in that they are not deducted from enterprise value to determine equity value.

The most common equity equivalent, deferred taxes, arises from differences in how businesses and the government account for taxes. For instance, the government typically uses accelerated depreciation to determine a company's taxes, whereas the accounting statements are prepared using straight-line depreciation. This leads to cash taxes that are lower than reported taxes during the early years of an asset's life. For growing companies, this difference will cause reported taxes consistently to overstate the company's actual tax payments. To avoid this bias, use cash-based (versus accrual) taxes to determine NOPLAT. Since reported taxes will now match cash taxes, the deferred-tax account—in this case related to accelerated depreciation—is no longer necessary. This is why the original deferred-tax account is referred to as an equity equivalent. It represents the adjustment to retained earnings that would be made if the company reported cash taxes to investors.

Not every deferred-tax account should be incorporated into cash taxes, only deferred-tax assets (DTAs) and deferred-tax liabilities (DTLs) *associated with ongoing operations*.[9] Nonoperating tax liabilities, such as deferred taxes related to pensions, should instead be valued as part of the corresponding liability. To compute operating cash taxes accurately, separate deferred taxes into the following three categories, and treat them as recommended:

1. *Operating deferred-tax assets and liabilities:* Deferred-tax liabilities (net of deferred-tax assets) related to the ongoing operation of the business should be treated as equity equivalents. For example, UPS carries deferred-tax assets related to vacation pay and accelerated depreciation, among others. They will be used to compute operating cash taxes in the next section.
2. *Nonoperating deferred-tax assets and liabilities:* Treat deferred-tax liabilities (net of deferred-tax assets) as an equity equivalent. Nonoperating deferred taxes are deferred taxes related to nonoperating assets (such as

[9]Separating deferred taxes into operating and nonoperating items often requires advanced knowledge of accounting conventions. For an in-depth discussion of deferred taxes, see Chapter 18.

EXHIBIT 9.8 **UPS: Deferred-Tax Assets and Liabilities**

$ million

Reported in UPS 10-K, note 12

	2011	2012	2013
Assets			
Pension and postretirement benefits	2,106	4,608	3,086
Loss and credit carryforwards	259	258	279
Insurance reserves	696	737	765
Vacation pay accrual	208	209	224
Stock compensation	211	159	70
Other deferred-tax assets	635	708	709
Deferred-tax assets	4,115	6,679	5,133
Valuation allowance	(205)	(220)	(251)
Deferred-tax assets, net	3,910	6,459	4,882
Liabilities			
Property, plant, and equipment	(3,607)	(3,624)	(3,613)
Intangible assets, capitalized software[1]	(878)	(969)	(1,023)
Intangible assets, acquired[2]	(73)	(66)	(93)
Other	(554)	(617)	(651)
Deferred-tax liabilities	(5,112)	(5,276)	(5,380)
Net deferred-tax assets (liabilities)	(1,202)	1,183	(498)

Reorganized financials

	2011	2012	2013
Operating deferred taxes			
Loss and credit carryforwards	259	258	279
Valuation allowance	(205)	(220)	(251)
Loss and credit carryforwards, net of taxes	54	38	28
Insurance reserves	696	737	765
Vacation pay accrual	208	209	224
Stock compensation	211	159	70
Other deferred-tax assets	635	708	709
Property, plant, and equipment	(3,607)	(3,624)	(3,613)
Intangible assets, capitalized software[1]	(878)	(969)	(1,023)
Other deferred-tax liabilities	(554)	(617)	(651)
Operating deferred-tax assets (liabilities)	(3,235)	(3,359)	(3,491)
Nonoperating deferred taxes			
Pension and postretirement benefits	2,106	4,608	3,086
Intangible assets, tax gross-up			
Intangible assets, acquired[2]	(73)	(66)	(93)
Net deferred-tax assets (liabilities)	(1,202)	1,183	(498)

[1] Estimated at the marginal tax rate times capitalized software.
[2] Estimated at the marginal tax rate times acquired intangibles.

pensions), debt (such as implicit interest), or debt equivalents (such as restructuring expenses).

3. *Intangible assets, gross-up:* As discussed earlier, deferred-tax liabilities related to amortization of acquired intangibles should be netted against acquired intangibles.

Exhibit 9.8 uses the UPS deferred-tax footnote to disaggregate deferred taxes into operating and nonoperating. To determine operating deferred taxes, start with operating related and ongoing deferred tax assets like loss and credit carryforwards,[10] self-insurance reserves, vacation pay, and stock compensation. From these accounts, subtract taxes related to accelerated depreciation and capitalized software. Operating deferred-tax liabilities totaled $3,491 million in 2013.

[10]For companies with significant tax loss carry-forwards, such as loss-making airlines, treat them as nonoperating and value them separately. In the case of UPS, we classified loss carryforwards as operating because they are relatively small and have been growing in line with the company's international expansion.

EXHIBIT 9.9 **UPS and FedEx: Historical Income Statement**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Revenues	53,105	54,127	55,438	42,680	44,287	45,567
Compensation and benefits[1]	(26,908)	(27,581)	(28,941)	(16,133)	(16,547)	(16,688)
Purchased transportation	(7,232)	(7,354)	(7,486)	(6,335)	(7,272)	(8,011)
Fuel	(4,046)	(4,090)	(4,027)	(4,956)	(4,746)	(4,557)
Depreciation	(1,554)	(1,614)	(1,682)	(2,095)	(2,359)	(2,564)
Amortization, capitalized software	(206)	(216)	(165)	–	–	–
Other expenses[2]	(6,151)	(6,147)	(6,164)	(8,751)	(9,109)	(9,300)
EBITA	7,008	7,125	6,973	4,410	4,254	4,447
Amortization, acquired intangibles	(22)	(28)	(20)	(18)	(27)	(23)
Severance and other restructuring charges[1]	–	(896)	–	(134)	(660)	–
Gains (losses) on asset sales[2]	33	–	(39)	–	–	–
Pension adjustments[3]	(667)	(4,625)	384	34	(23)	133
Operating lease interest[4]	(272)	(233)	(264)	(1,126)	(1,017)	(1,132)
Amortization of past sale/leaseback gains[5]	–	–	–	20	24	21
Operating profit, as reported	6,080	1,343	7,034	3,186	2,551	3,446
Interest expense	(348)	(393)	(380)	(52)	(82)	(160)
Investment income	44	24	20	13	21	18
Other income (expenses)	–	–	–	(6)	(35)	(15)
Earnings before taxes	5,776	974	6,674	3,141	2,455	3,289
Income tax expense	(1,972)	(167)	(2,302)	(1,109)	(894)	(1,192)
Net income	3,804	807	4,372	2,032	1,561	2,097

[1] Compensation and benefits, excluding severance and other restructuring charges, and pension adjustments.
[2] Other expenses, excluding gains (losses) on asset sales, operating lease interest, and amortization of past sale/leaseback gains.
[3] Pension adjustments are detailed in Exhibit 9.16.
[4] Capitalized operating lease adjustments are detailed in Exhibit 9.15.
[5] Amortization of past sale/leaseback gains is detailed in Exhibit 9.17.

Operating DTLs are treated as an equity equivalent in Exhibit 9.5, and the change in operating DTLs will be the basis for computing cash taxes later in this chapter. Nonoperating DTLs are also treated as an equity equivalent in Exhibit 9.5. Only DTLs related to acquired intangibles are netted against their corresponding account.

Calculating NOPLAT

To determine NOPLAT for UPS and FedEx, we turn to their respective income statements (see Exhibit 9.9) and convert each income statement into NOPLAT (see Exhibit 9.10).

Net operating profit (NOP or EBITA) NOPLAT starts with earnings before interest, taxes, and amortization (EBITA) of acquired intangibles, which equals revenue less operating expenses (e.g., cost of goods sold, selling costs, general and administrative costs, depreciation).

EXHIBIT 9.10 **UPS and FedEx: NOPLAT Calculation**

$ million

	UPS			FedEx		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
Revenues	53,105	54,127	55,438	42,680	44,287	45,567
Compensation and benefits	(26,908)	(27,581)	(28,941)	(16,133)	(16,547)	(16,688)
Purchased transportation	(7,232)	(7,354)	(7,486)	(6,335)	(7,272)	(8,011)
Fuel	(4,046)	(4,090)	(4,027)	(4,956)	(4,746)	(4,557)
Depreciation	(1,554)	(1,614)	(1,682)	(2,095)	(2,359)	(2,564)
Amortization, capitalized software	(206)	(216)	(165)	–	–	–
Other expenses	(6,151)	(6,147)	(6,164)	(8,751)	(9,109)	(9,300)
EBITA	7,008	7,125	6,973	4,410	4,254	4,447
Operating cash taxes[1]	(2,155)	(2,238)	(2,289)	(725)	(1,297)	(1,540)
NOPLAT	4,853	4,887	4,684	3,685	2,957	2,907
Reconciliation with net income						
Net income	3,804	807	4,372	2,032	1,561	2,097
Decrease (increase) in operating deferred taxes[2]	317	124	131	855	264	84
Adjusted net income	4,121	931	4,503	2,887	1,825	2,181
Amortization, acquired intangibles	22	28	20	18	27	23
Amortization of past sale/leaseback gains	–	–	–	(20)	(24)	(21)
Severance and other restructuring charges	–	896	–	134	660	–
Gains (losses) on asset sales	(33)	–	39	–	–	–
Pension adjustments	667	4,625	(384)	(34)	23	(133)
Operating lease interest	272	233	264	1,126	1,017	1,132
Interest expense	348	393	380	52	82	160
Less: Investment income	(44)	(24)	(20)	(13)	(21)	(18)
Other expenses (income)	–	–	–	6	35	15
Nonoperating taxes[1]	(500)	(2,195)	(118)	(471)	(667)	(432)
NOPLAT	4,853	4,887	4,684	3,685	2,957	2,907

[1] Operating and nonoperating taxes calculation is detailed in Exhibit 9.12.
[2] Operating deferred tax liabilities, net of operating deferred tax assets.

Why use EBITA and not EBITDA? When a company purchases a physical asset such as equipment, it capitalizes the asset on the balance sheet and depreciates the asset over its lifetime. Since the asset wears out over time, depreciation is included as an operating expense when determining NOPLAT as a rough proxy for the deterioration of that asset.

Why use EBITA and not EBIT? After all, the same argument could be made for the amortization of acquired intangibles: they, too, have fixed lives and lose value over time. But the accounting for intangibles differs from the accounting for physical assets. Unlike capital expenditures, organic investment in intangibles such as new customer lists and product brands are *expensed* and not capitalized. Thus, when the acquired intangible loses value and is replaced through additional investment, the reinvestment is *already* expensed, and the company is penalized twice: once through amortization and a second time through reinvestment. Using EBITA avoids double-counting amortization expense in this way.

Adjustments to EBITA In many companies, nonoperating income expenses are embedded within EBITA. To ensure that EBITA arises solely from operations, dig through the notes to weed out nonoperating items. The most common nonoperating items are related to pensions, embedded interest expenses from operating leases, restructuring charges hidden in the cost of sales, and gains or losses from asset sales.

When a number of adjustments are required, reorganize the income statement prior to creating NOPLAT.[11] In Exhibit 9.9, we separate six items that were included in the UPS and FedEx reported operating profit.[12] For instance, in 2012, UPS took an $896 million charge to withdraw from the New England plan and another $4,625 million in actuarial losses to revalue its defined benefit pension liability primarily due to lower interest rates.[13] Both these charges were incorporated in the compensation and benefits number reported by UPS, causing the number to spike in 2012, and reported operating profit to plummet.[14] To best reflect UPS's *ongoing* compensation and benefits, separate these charges from ongoing activities. This separation, however, will not change the ultimate level of pretax profit or net income. The separation merely makes like-to-like comparison simpler to conduct and better reflects the underlying operating performance of the company.

Adjustments related to pensions and operating leases are briefly addressed at the end of this chapter and in detail in Part Three, which covers advanced valuation issues.

Operating taxes Since nonoperating items also affect reported taxes, taxes must be *adjusted* to an all-equity operating level. The process for adjusting taxes can be complex. Chapter 18 provides an in-depth explanation of the process we

[11] In the case of UPS, we separate nonoperating expenses from operating expenses because the location of each nonoperating expense is disclosed. To value Heineken in Chapter 24, we do not adjust individual expenses and instead add back the nonoperating expense as a new line item.

[12] We define operating profit as profits related to the company's consolidated businesses that are ongoing in nature. The accounting bodies are very strict in their definition of operating profit, excluding only a few items such as interest expense and investment income. For instance, UPS includes the sale of a distribution facility as part of reported operating income, whereas we do not.

[13] To reconcile the compensation and benefits in Exhibit 9.9 with UPS's reported compensation and benefits, add $896 million and $4,625 million to compensation and benefits of $27,581 million. The total $33,102 million matches the reported number found in the UPS 10-K. Actuarial losses were common among companies with large defined-benefit pensions, as accounting rules require that pension assets and liabilities be "marked to market." Based on accounting requirements, UPS and other companies reduced the interest rate they used to calculate the present value of pension obligations, leading to a significant increase in the measured liability, much of which flowed through the income statement. The FASB has recognized that many investors and others don't consider these charges as operating expenses and is considering whether to undertake a project to more clearly distinguish between operating and nonoperating items such as pension revaluation.

[14] Unlike UPS, which reports under U.S. GAAP, companies that report under IFRS already separate nonoperating pension expenses from EBITA. For more on pension adjustments, see Chapter 20.

EXHIBIT 9.11 **UPS and FedEx: Tax Reconciliation Table**

%

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Statutory U.S. federal income tax rate	35.0	35.0	35.0	35.0	35.0	35.0
U.S. state and local income taxes	2.0	–	2.1	2.1	2.1	2.3
Non-U.S. tax rate differential	(0.4)	(6.1)	(1.3)	–	–	–
Nondeductible/nontaxable items	(0.1)	(0.4)	(0.2)	–	–	–
U.S. federal tax credits	(1.7)	(7.4)	(1.2)	–	–	–
Other	(0.7)	(4.0)	0.1	(1.8)	(0.7)	(1.0)
Effective tax rate	34.1	17.1	34.5	35.3	36.4	36.3
Earnings before taxes, $ million	5,776	974	6,674	3,141	2,455	3,289

Source: UPS 10-K, note 12, and FedEx 10-K, note 12.

recommend for computing operating cash taxes. To estimate operating taxes, proceed in three steps:

1. Search the footnotes for the tax reconciliation table. For tables presented in dollars (or other home currencies), build a second reconciliation table in percents, and vice versa. To convert percents into dollars, multiply by earnings before taxes; to convert dollars into percents, divide by earnings before taxes. Data from both tables are necessary to complete the remaining steps.
2. Using the percent-based tax reconciliation table, determine the marginal tax rate. The marginal tax rate equals the government tax rate paid on income (in the United States, companies pay federal and state taxes on income). Multiply the marginal tax rate by adjusted EBITA to determine marginal taxes on EBITA.
3. Using the dollar-based tax reconciliation table, adjust operating taxes by other operating items not included in the marginal tax rate. The most common adjustment is related to differences in foreign tax rates.

To demonstrate the three-step process, let's examine the operating tax rate for UPS. Start by converting the reported tax reconciliation table (presented in Exhibit 9.11) into dollars.[15] The results of this conversion are presented in the top half of Exhibit 9.12. To convert each line item from percent into dollars, multiply the particular line item by *earnings before taxes* (for UPS, $6,674 million in 2013). Earnings before taxes are reported on the income statement (see Exhibit 9.9). We use the dollar-denominated table in step 3.

Next, use the percentage-based tax reconciliation table to determine the marginal tax rate. You can use the company's statutory rate plus state or local

[15]For an example of a company that reports its tax reconciliation table in currency, see Home Depot in the United States or Heineken in the Netherlands.

EXHIBIT 9.12 **UPS and FedEx: Operating Taxes and Operating Cash Taxes**

$ million

	UPS			FedEx		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
Step 1: Convert percentage tax table into dollars						
Statutory U.S. federal income tax rate	2,022	341	2,336	1,099	859	1,151
U.S. state and local income taxes	116	0	140	66	52	76
Non-U.S. tax rate differential[1]	(23)	(59)	(87)	0	0	0
Nondeductible/nontaxable items	(6)	(4)	(13)	0	0	0
U.S. federal tax credits[1]	(98)	(72)	(80)	0	0	0
Other[2]	(38)	(39)	6	(56)	(17)	(35)
Reported taxes	1,972	167	2,302	1,109	894	1,192
Step 2: Apply marginal tax rate to adjusted EBITA						
Marginal tax rate, %	37.0	35.0	37.1	37.1	37.1	37.3
× EBITA	7,008	7,125	6,973	4,410	4,254	4,447
= Marginal taxes on EBITA	2,593	2,494	2,587	1,636	1,578	1,659
Step 3: Adjust taxes for other operating items						
Other operating taxes	(121)	(131)	(167)	(56)	(17)	(35)
Operating taxes	2,472	2,362	2,420	1,580	1,561	1,624
Reconciliation to reported taxes						
Operating taxes	2,472	2,362	2,420	1,580	1,561	1,624
Nonoperating taxes	(500)	(2,195)	(118)	(471)	(667)	(432)
Reported taxes	1,972	167	2,302	1,109	894	1,192
Operating cash taxes						
Operating taxes	2,472	2,362	2,420	1,580	1,561	1,624
Increase in operating deferred taxes[3]	(317)	(124)	(131)	(855)	(264)	(84)
Operating cash taxes	2,155	2,238	2,289	725	1,297	1,540

[1] Classified as operating for UPS.
[2] Classified as nonoperating for UPS, but operating for FedEx.
[3] Increase in operating deferred-tax liabilities, net of operating deferred-tax assets.

taxes to calculate a proxy for the marginal rate. In 2013, UPS paid 37.1 percent in taxes: federal (35.0 percent) and state (2.1 percent). Use this marginal rate to compute taxes on adjusted EBITA. In 2013, taxes on adjusted EBITA equaled $2,587 million (37.1 percent times $6,973 million in EBITA).

After computing taxes on adjusted EBITA, search the dollar-based reconciliation table for other operating taxes. For UPS, the two operating taxes paid beyond marginal taxes were foreign-rate differences and U.S. tax credits.[16] In 2013, foreign-rate differences lowered taxes by $87 million, and U.S. tax credits lowered the number by an additional $80 million. Therefore, lower taxes on adjusted EBITA by $167 million to determine operating taxes in 2013.[17]

[16]Countries have different statutory tax rates on income. Thus, when a company's foreign income is taxed at a rate lower than its domestic income, a deduction appears on the tax reconciliation table. When foreign income is repatriated, a company's home country typically requires it to pay the difference between the two rates.

[17]The tax reconciliation at FedEx includes only federal, state, and other taxes. Since other taxes were relatively small and consistent, we treated them as operating.

When adjusting marginal taxes for other operating items, we prefer to use dollar adjustments rather than percentage adjustments. To see why, look at the percentages in Exhibit 9.11 for UPS in 2012. Because of the company's multibillion-dollar pension charge in that year, earnings before taxes were uncharacteristically low, making foreign tax savings and U.S. tax credits appear uncharacteristically large on a percentage basis (6.1 and 7.4 percent, respectively). As a consequence, extrapolating this tax rate for cash flow forecasting would lead to a significant overvaluation.

Reconciliation of reported taxes To reconcile NOPLAT to net income and free cash flow to cash flow available to investors, it is necessary to compute nonoperating taxes. Nonoperating taxes include taxes paid on nonoperating income, tax shields from interest expense, and other nonoperating taxes from the tax reconciliation table. Determine nonoperating taxes by computing the difference between reported taxes and operating taxes. For instance, UPS had a net $118 million tax shield from nonoperating items in 2013 (see Exhibit 9.12).

Operating cash taxes We recommend using operating cash taxes actually paid, if possible, rather than accrual-based taxes reported.[18] The simplest way to calculate cash taxes is to subtract the increase in *operating deferred-tax liabilities* (net assets) from operating taxes. Exhibit 9.8 separates UPS's net operating DTLs from its net nonoperating DTLs. UPS's net operating DTLs have been rising steadily over the past few years, so reported taxes slightly overstate actual cash taxes. Subtracting the annual increase (or adding the decrease) in operating deferred taxes gives cash taxes.

In 2013, operating taxes were decreased by $131 million at UPS because *operating* deferred taxes rose from $3,359 million to $3,491 million, as reported in Exhibit 9.8. Using changes in deferred taxes to compute cash taxes requires special care. As discussed in the section on invested capital, only changes in *operating-based* deferred taxes are included in cash taxes. Otherwise, changes in deferred taxes might be double-counted: once in NOPLAT and potentially again as part of the corresponding item.[19]

Similar to other accounts, deferred-tax accounts rise and fall as a result of acquisitions and divestitures. However, only organic increases in deferred taxes should be included in operating cash taxes, not one-time increases resulting from consolidation. For companies involved in multiple mergers and

[18]Not every company discloses enough information to separate operating deferred taxes, such as accelerated depreciation, from nonoperating deferred taxes, such as those related to prepaid pension assets. When this information is unavailable, we recommend using operating taxes without a cash adjustment.
[19]For instance, future taxes on pension shortfalls should be computed using projected contributions, not on the historical deferred tax account.

acquisitions, a clean measure of operating cash taxes may be impossible to calculate. When this is the case, use operating taxes without the adjustment for cash.

Reconciliation to Net Income

To ensure that the reorganization is complete, we recommend reconciling net income to NOPLAT (see the lower half of Exhibit 9.10). To reconcile NOPLAT, start with net income, and add back the increase (or subtract the decrease) in operating deferred-tax liabilities. Next, add the expenses (or subtract the income) for any adjustments you make to operating income, such as severance charges, lease interest, and pension adjustments. Next, add any nonoperating charges (or subtract income) reported by the company, such as interest expense and investment income. Finally, subtract nonoperating tax shields computed when determining operating taxes.

Free Cash Flow: In Practice

This subsection details how we build free cash flow from the reorganized financial statements. To make further adjustments specific to free cash flow and its reconciliation, the statement of retained earnings and statement of accumulated other comprehensive income are also required. Exhibit 9.13 reports these

EXHIBIT 9.13 **UPS and FedEx: Retained Earnings and Accumulated Other Comprehensive Income**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Statement of retained earnings						
Starting retained earnings	14,164	10,128	7,997	15,266	17,134	18,519
Net income	3,804	807	4,372	2,032	1,561	2,097
Dividends	(2,086)	(2,243)	(2,367)	(164)	(176)	(187)
Share repurchases	(2,194)	(695)	(3,077)	–	–	–
Accounting changes	(3,560)	–	–	–	–	–
Ending retained earnings	10,128	7,997	6,925	17,134	18,519	20,429
Accumulated other comprehensive income						
Starting accumulated other comprehensive income	(6,195)	(3,103)	(3,354)	(2,550)	(4,953)	(3,820)
Foreign-currency translation	(92)	294	(260)	(95)	41	(25)
Marketable securities, mark-to-market	(6)	–	(7)	–	–	–
Cash flow hedges	35	(82)	67	–	–	–
Unrecognized pension benefits	(405)	(463)	3,094	(2,308)	1,092	151
Accounting changes	3,560	–	–	–	–	–
Ending accumulated other comprehensive income	(3,103)	(3,354)	(460)	(4,953)	(3,820)	(3,694)

for UPS and FedEx. Free cash flow is defined as:

$$\text{FCF} = \text{NOPLAT} + \text{Noncash Operating Expenses} - \text{Investments in Invested Capital}$$

Exhibit 9.14 builds the free cash flow calculation and reconciles free cash flow to cash flow available to investors for both UPS and FedEx. The components of free cash flow are gross cash flow and investments in invested capital. If possible, investments in invested capital should be separated into organic investments and investments made through acquisition.

Gross cash flow Gross cash flow represents the cash flow generated by the company's operations. It represents the cash available for investment and investor payout without the company having to sell nonoperating assets (e.g., excess cash) or raise additional capital. Gross cash flow has two components:

1. *NOPLAT:* As previously defined, net operating profits less adjusted taxes are the after-tax operating profits available to all investors.
2. *Noncash operating expenses:* Some expenses deducted from revenue to generate NOPLAT are noncash expenses. To convert NOPLAT into cash flow, add back depreciation and amortization.[20] Only add back amortization deducted from revenues to compute NOPLAT. For UPS, we add back the amortization of capitalized software, which had been deducted to compute EBITA. Do not add back the amortization from acquired intangibles and impairments to NOPLAT; they were not subtracted in calculating NOPLAT.

Investments in invested capital To maintain and grow their operations, companies must reinvest a portion of their gross cash flow back into the business. To determine free cash flow, subtract gross investment from gross cash flow. We segment gross investment into five primary areas:

1. *Change in operating working capital:* Growing a business requires investment in operating cash, inventory, and other components of working capital. Operating working capital excludes nonoperating assets, such as excess cash, and financing items, such as short-term debt and dividends payable.
2. *Net capital expenditures:* Net capital expenditures equal investments in property, plant, and equipment (PP&E), less the book value of any PP&E

[20] A major noncash expense is share-based employee compensation. Although noncash, do not add back share-based compensation to NOPLAT to determine gross cash flow. Since employees will have a new claim on cash flows, this claim must be incorporated into the valuation, either as part of cash flow or as a separate calculation. Share-based employee compensation is discussed in Chapter 14.

EXHIBIT 9.14 **UPS and FedEx: Free Cash Flow Calculation**

$ million

	UPS			FedEx		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
NOPLAT	4,853	4,887	4,684	3,685	2,957	2,907
Depreciation	1,554	1,614	1,682	2,095	2,359	2,564
Amortization of capitalized software	206	216	165	–	–	–
Gross cash flow	6,613	6,717	6,531	5,780	5,316	5,471
Decrease (increase) in operating working capital	92	401	71	(308)	366	(643)
Capital expenditures, net of disposals	(1,788)	(1,887)	(1,749)	(3,800)	(3,595)	(3,630)
Investments in capitalized operating leases	(39)	255	(412)	(694)	(1,507)	(1,232)
Investments in capitalized software	(229)	(243)	(273)	–	–	–
Investments in goodwill and acquired intangibles	(11)	(88)	(66)	(70)	(409)	(40)
Decrease (increase) in other operating assets, net other liabilities	(470)	(112)	36	(12)	198	128
Foreign-currency translation	(92)	294	(260)	(95)	41	(25)
Gross investment	(2,538)	(1,380)	(2,654)	(4,979)	(4,906)	(5,441)
Free cash flow	4,075	5,337	3,877	802	409	30
Severance and other restructuring charges	–	(896)	–	(134)	(660)	–
Gains (losses) on asset sales, impairments	33	–	(39)	–	–	–
Deferred sale/leaseback gains[1]	–	–	–	25	–	–
Investment income	44	24	20	13	21	18
Other income (expenses)	–	–	–	(6)	(35)	(15)
Nonoperating taxes, excluding amortization and pensions[2]	245	567	253	484	658	481
Decrease (increase) in excess cash[3]	(129)	(3,629)	2,698	(447)	(2,042)	2,035
Decrease (increase) in investments	458	271	53	–	–	–
Cash flow hedges	35	(82)	67	–	–	–
Nonoperating cash flow	686	(3,745)	3,052	(65)	(2,058)	2,519
Cash flow available to investors	4,761	1,592	6,930	737	(1,649)	2,548
Reconciliation of cash flow available to investors						
Interest expense	348	393	380	52	82	160
Operating lease interest expense	272	233	264	1,126	1,017	1,132
Decrease (increase) in short-term debt	322	(1,748)	1,733	(399)	166	250
Decrease (increase) in long-term debt	(604)	6	265	417	(1,489)	(1,997)
Decrease (increase) in capitalized operating leases	(39)	255	(412)	(694)	(1,507)	(1,232)
Pension and postretirement benefits, net cash out (in)[4]	187	(479)	(811)	113	59	(109)
Flows to debt holders	486	(1,339)	1,419	615	(1,672)	(1,796)
Cash dividends	2,086	2,243	2,367	164	176	187
Repurchased (issued) shares	2,194	695	3,078	(42)	(153)	4,157
Decrease (increase) in noncontrolling interests	(5)	(7)	66	–	–	–
Flows to equity holders	4,275	2,931	5,511	122	23	4,344
Cash flow available to investors	4,761	1,592	6,930	737	(1,649)	2,548

[1] Deferred gains on sale/leaseback are detailed in Exhibit 9.17.
[2] Nonoperating tax shields exclude tax shields on amortization of acquired intangibles, amortization of deferred gains, and pension adjustments.
[3] Change in excess cash adjusted for mark-to-market accounting.
[4] Pension and postretirement benefits are detailed in Exhibit 9.16.

sold. One way to estimate net capital expenditures is to add the increase in net PP&E to depreciation.[21] Do not estimate capital expenditures by taking the change in gross PP&E. Since gross PP&E drops when companies retire assets (which has no cash implications), the change in gross PP&E will often understate the actual amount of capital expenditures.

3. *Change in capitalized operating leases:* To keep the definitions of NOPLAT, invested capital, and free cash flow consistent, include investments in capitalized operating leases in gross investment. Capitalized operating leases are discussed later in the chapter.
4. *Investment in goodwill and acquired intangibles:* For acquired intangible assets, where cumulative amortization has been added back, you can estimate investment by computing the change in net goodwill and acquired intangibles. For intangible assets that are being amortized, use the same method as for determining net capital expenditures (by adding the increase in net intangibles to amortization).
5. *Change in other long-term operating assets, net of long-term liabilities:* Subtract investments in other net operating assets. As with invested capital, do not confuse other long-term operating assets with other long-term nonoperating assets, such as equity investments and excess pension assets. Changes in equity investments need to be evaluated—but should be measured separately.

Since companies translate foreign balance sheets into their home currencies, changes in accounts will capture both true investments (which involve cash) and currency-based restatements (which are merely accounting adjustments and not the flow of cash into or out of the company). Removing the currency effects line item by line item is impossible. But we can partially undo their effect by subtracting the increase in the equity item titled “foreign-currency translation,” which under U.S. GAAP and IFRS is found within the statement of accumulated other comprehensive income.[22] By subtracting the increase, we undo the effect of changing exchange rates.

Another effect that contributes to the change in balance sheet accounts is restatements due to acquisitions and divestitures. In some cases, the company

[21] If possible, use capital expenditures reported in the accounting statement of cash flows, but only after reconciling reported capital expenditures with the change of net PP&E plus depreciation. Capital expenditures can differ from net PP&E plus depreciation because of currency translations, acquisitions, and impairments. Acquisitions should be analyzed separately, and impairments should be treated as a nonoperating noncash expense in the income statement. Currency translations are discussed later in this section.

[22] The foreign-currency translation includes adjustments for both operating and nonoperating items. Since the line item cannot be disaggregated into these two components, judgment is required on where to include the change in accounts.

will report line-by-line adjustments, enabling the acquisition or divestiture to be separated from the organic change.[23]

Cash Flow Available to Investors

Although not included in free cash flow, cash flows related to nonoperating assets are valuable in their own right. They must be evaluated and valued separately and then added to free cash flow to give the total cash flow available to investors:

$$\begin{array}{c}\text{Present Value}\\ \text{of Company's}\\ \text{Free Cash Flow}\end{array} + \begin{array}{c}\text{Value of}\\ \text{Nonoperating}\\ \text{Assets}\end{array} = \begin{array}{c}\text{Total Value}\\ \text{of}\\ \text{Enterprise}\end{array}$$

To reconcile free cash flow with total cash flow available to investors, include the following nonoperating cash flows:

- *Nonoperating income and expenses:* Unless you can net the account against a change in a corresponding asset or liability (because it is noncash), include nonoperating income and expenses in total cash flow available to investors, not in free cash flow.[24]
- *Nonoperating taxes:* Include nonoperating taxes in total cash flow available to investors.[25]
- *Cash flow related to excess cash and marketable securities:* Subtract the increase (or add the decrease) in excess cash and marketable securities to compute total cash flow available to investors. If the company reports unrecognized gains and losses related to marketable securities in its statement of other comprehensive income, net the gain or loss against the change computed previously.
- *Cash flow from other nonoperating assets:* Repeat the process used for excess cash and marketable securities for other nonoperating assets. When

[23]For instance, Home Depot divested its HD supply business in 2007. The company reported the divestiture effect on individual accounts, enabling a computation of organic cash flow. Adjusting for acquisitions and divestitures is a time-consuming process. Therefore, adjust cash flow to allow for the effects of both only when the resulting adjustments will be substantial.

[24]In 2012, UPS recorded a one-time charge for $896 million to leave the New England plan. In that same year, FedEx recorded a $660 million expense for business realignment. We moved these charges into an account titled "Severance and other restructuring charges." Since it was unclear whether the FedEx charge was a cash or a noncash charge (there was no obvious jump in a particular account), we did not net this account against the change in nonoperating liabilities, and instead recorded it as a separate line item.

[25]Nonoperating taxes in Exhibit 9.14 do not match nonoperating taxes in Exhibit 9.12, because the amortization tax shield (of acquired intangibles in the case of UPS and of deferred gains on sale/leaseback in the case of FedEx) has been netted against the change in deferred taxes. In addition, the pension tax shield has been included with other pension flows (for better year-to-year comparability). Cash flows related to pensions are calculated in a later exhibit.

possible, combine nonoperating income from a particular asset with changes in that nonoperating asset.

Reconciling Cash Flow Available to Investors

Cash flow available to investors should be identical to the company's total financing flow. By modeling cash flow to and from investors, you will catch mistakes otherwise missed. Financial flows include flows related to debt, debt equivalents, and equity:

- *Interest expenses:* Interest from both traditional debt and operating leases should be treated as a financing flow.
- *Debt issues and repayments:* The change in debt represents the net borrowing or repayment on all the company's interest-bearing debt, including short-term debt, long-term debt, and capitalized operating leases. All changes in debt should be included in the reconciliation of total funds invested, not in free cash flow.
- *Change in debt equivalents:* Since accrued pension liabilities and accrued postretirement medical liabilities are considered debt equivalents (see Chapter 20 for more on issues related to pensions and other postretirement benefits), their changes should be treated as a financing flow.[26]
- *Dividends:* Dividends include all cash dividends on common and preferred shares. Dividends paid in stock have no cash effects and should be ignored.
- *Share issues and repurchases:* When new equity is issued or shares are repurchased, four accounts will be affected: common stock, additional paid-in capital, treasury shares, and retained earnings (for shares that are retired). Although different transactions will have varying effects on the individual accounts, only the aggregate matters, not how the individual accounts are affected. Exhibit 9.14 refers to the aggregate change as "Repurchased (issued) shares."

ADVANCED ISSUES

In this section, we summarize a set of the most common advanced topics in reorganizing a company's financial statements, including operating leases, pensions, capitalized research and development (R&D), nonoperating charges, and restructuring reserves. We provide only a brief summary of these topics

[26]Pensions will affect many accounts, including the pension expense on the income statement, pension assets, pension liabilities, and deferred taxes. A later exhibit aggregates each of the pension accounts into a single number for the cash flow statement.

here, as each one is discussed in depth in the chapters of Part Three, "Advanced Valuation Techniques."

Operating Leases

When a company leases an asset under certain conditions, it need not record either an asset or a liability. Instead, it records the rental charge as an expense each period and reports future commitments in the notes.[27] To compare asset intensity effectively across companies with different leasing policies, include the value of the lease as an operating asset, with a corresponding debt recorded as a financing item. Otherwise, companies that lease assets will appear "capital light" relative to identical companies that purchase the assets.

Companies typically do not disclose the value of their leased assets. Chapter 20 evaluates alternatives for estimating the value of leased assets. Here we describe a common approach: multiply rent expense by an appropriate capitalization factor, based on the cost of debt (k_d) and average asset life:[28]

$$\text{Asset Value}_{t-1} = \frac{\text{Rental Expense}_t}{\left(k_d + \frac{1}{\text{Asset Life}}\right)}$$

For UPS, if we apply the 5.3 percent cost of its debt (AA-rated debt) and assume an asset life of 20 years, we can convert $575 million in 2013 rental expense to $5.4 billion in 2012 operating leases.[29] Exhibit 9.15 presents the resulting adjustment for operating leases for UPS and FedEx. When capitalizing operating leases to estimate invested capital, also make sure to eliminate the interest cost embedded in rental expense from operating profits. For UPS in 2013, Exhibit 9.15 shows that $264 million in embedded interest is added back to reported EBITA to compute total EBITA.

Also, operating taxes are adjusted to remove the associated tax shield. This raises both the numerator (NOPLAT) and the denominator (invested capital) of ROIC. For most companies, capitalizing operating leases lowers a company's ROIC. For UPS in 2013, ROIC drops from 21.2 percent to 16.9 percent, and for FedEx, it drops from 9.5 percent to 6.2 percent. The reduction in FedEx's ROIC actually reduces its ROIC below its WACC.

[27] In August 2010, the FASB and IASB issued an exposure draft proposing the capitalization of operating leases that would make the adjustments in this section necessary for historical benchmarking only. However, reaction to the proposal was mixed. Consequently, two revised proposals were issued in 2013 and 2014. At the time of this writing, no final action on them has been taken.

[28] Chapter 20 derives an appropriate capitalization factor based on the cost of secured debt and average asset life.

[29] We use AA-rated debt over a 10-year period to estimate lease interest cost, because long-term lease rates are negotiated at the time of rental. Rental expense is not typically disclosed in the financial statements. For UPS, rental expense of $575 million is reported in note 7, "Debt and financing arrangements," in the company's 2013 annual report.

EXHIBIT 9.15 **UPS and FedEx: Impact of Capitalizing Operating Leases on ROIC**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
EBITA						
EBITA (using rental expense)	6,736	6,892	6,709	3,284	3,237	3,315
Implied interest[1]	272	233	264	1,126	1,017	1,132
EBITA	7,008	7,125	6,973	4,410	4,254	4,447
Operating cash taxes						
Operating cash taxes (using rental expense)	2,031	2,113	2,148	307	920	1,118
Tax shield on operating lease interest expense	124	125	140	418	377	422
Operating cash taxes	2,155	2,238	2,289	725	1,297	1,540
NOPLAT						
NOPLAT (using rental expense)	4,705	4,779	4,561	2,977	2,317	2,197
NOPLAT (capitalizing operating leases)	4,853	4,887	4,684	3,685	2,957	2,907
Invested capital						
Invested capital (without operating leases)	22,185	21,617	21,494	21,047	22,403	23,991
Capitalized operating leases	5,428	5,841	6,511	22,195	23,427	24,691
Invested capital	27,614	27,458	28,004	43,242	45,830	48,682
Return on invested capital						
ROIC (using rental expenses), %	21.7	21.8	21.2	14.6	10.7	9.5
ROIC (capitalizing operating leases), %	17.8	17.7	16.9	8.8	6.6	6.2

[1] In this case, implied interest equals each company's cost of debt times the prior year's value of operating leases. We normally prefer to use the secured cost of debt to compute an embedded interest expense, but instead use the company's cost of debt in order to tie enterprise DCF to equity cash flow valuation in Chapter 8.

Whether or not you capitalize operating leases will not affect intrinsic value as long as it is incorporated correctly in free cash flow, the cost of capital, and debt equivalents.

Pensions and Other Postretirement Benefits

Following the passage of FASB Statement 158 under U.S. GAAP in 2006, companies now report the present value of pension shortfalls (and excess pension assets) on their balance sheets.[30] Since excess pension assets do not generate operating profits, nor do pension shortfalls fund operations, pension accounts should not be included in invested capital. Instead, pension assets should be treated as nonoperating items, and pension shortfalls as a debt equivalent (and both should be valued separately from operations).[31] Reporting rules

[30]From December 2006, FASB Statement 158 eliminated pension smoothing on the balance sheet. Companies are now required to report excess pension assets and unfunded pension obligations on the balance sheet at their current values, not smoothed value as in the past.

[31]If pension accounts are not explicitly detailed on the company's balance sheet, search the pension footnote to determine where they are embedded. Often excess pension assets are embedded in other assets, and unfunded pension liabilities are in other liabilities.

EXHIBIT 9.16 **UPS and FedEx: Pension Income Adjustment and Pension-Related Cash Flow**

$ million	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Pension note in 10-K						
Service cost	993	1,128	1,499	628	734	695
Interest cost	1,555	1,659	1,678	1,012	1,004	1,095
Expected return on assets	(1,894)	(2,035)	(2,235)	(1,240)	(1,383)	(1,495)
Amortization of transition obligation	–	–	–	–	–	–
Amortization of prior service cost	179	180	178	–	–	–
Actuarial (gain) loss	827	4,831	–	194	402	267
Other costs	–	(10)	(5)	–	–	–
Net periodic benefit cost	1,660	5,753	1,115	594	757	562
Pension adjustment for income statement						
Service cost	993	1,128	1,499	628	734	695
Less: Net periodic benefit cost	(1,660)	(5,753)	(1,115)	(594)	(757)	(562)
Pension adjustment	(667)	(4,625)	384	34	(23)	133
Reconciliation of cash flow available to investors						
Pension adjustment	667	4,625	(384)	(34)	23	(133)
Tax shield for pension adjustment	(247)	(1,619)	142	13	(9)	50
Increase (decrease) in postretirement assets	(42)	25	21	–	–	–
Decrease (increase) in postretirement liabilities	(838)	(6,475)	4,026	(3,458)	1,666	432
Decrease (increase) in unrecognized pension benefits[1]	405	463	(3,094)	2,308	(1,092)	(151)
Increase (decrease) in deferred taxes related to pensions[2]	242	2,502	(1,522)	1,284	(529)	(307)
Pension and postretirement benefits, net cash out (in)	187	(479)	(811)	113	59	(109)

[1] Unrecognized pension benefits are detailed in Exhibit 9.13.
[2] Deferred taxes are detailed in Exhibit 9.8.

under IFRS (IAS 19) differ slightly in that companies can postpone recognition of their unfunded pension obligations resulting from changes in actuarial assumptions, but only as long as the cumulative unrecognized gain or loss does not exceed 10 percent of the obligations. For companies reporting under IFRS, search the notes for the current value of obligations.

FASB Statement 158 addressed deficiencies concerning pension obligations on U.S. balance sheets, but not on income statements. Pension expense, often embedded in cost of sales, aggregates the benefits given to employees for current work (known as the service cost) and the interest cost associated with pension liabilities, less the expected return on plan assets as well as a portion of the revaluation of pension assets and liabilities due to changes in interest rates and the value of the pension's portfolio of investments. Only the service cost is an operating cost. So operating costs and profits and must be adjusted to exclude any other pension items.

Exhibit 9.16 calculates the pension adjustment using the pension note from the UPS and FedEx 10-Ks. In 2012, the pension expense for UPS was $5,753 million. This expense was embedded in compensation and benefits on UPS's income statement. Yet the majority of this expense was because of actuarial losses due to revaluation of the pension liability as a result of lower interest rates. Therefore, it (and other nonoperating items) should be removed from compensation and benefits, so only the service cost remains. As can be seen in Exhibit 9.16, UPS has generated higher service costs over the last three years, whereas FedEx has been holding the service cost relatively constant.

Chapter 20 provides more detail on how to adjust NOPLAT for pensions and how to factor under- or overfunded pensions into a company's value.

Capitalized Research and Development

In line with the conservative principles of accounting, accountants expense R&D, advertising, and certain other costs in their entirety in the period they are incurred, even when economic benefits resulting from such expenses continue beyond the current reporting period.[32] This practice can dramatically understate invested capital and overstate return on capital for some companies. Therefore, you should consider whether it would be effective to capitalize and amortize R&D and other quasi investments in a manner similar to that used for capital expenditures. Equity should be adjusted correspondingly to balance the invested-capital equation.

If you decide to capitalize R&D, the R&D expense must *not* be deducted from revenue to calculate operating profit. Instead, deduct the amortization associated with past R&D investments, using a reasonable amortization schedule. Since amortization is based on past investments (versus expense, which is based on current outlays), this approach will prevent reductions in R&D from driving short-term improvements in ROIC.

Whether or not you capitalize certain expenses will not affect computed value; it will affect only the timing of ROIC and economic profit. Chapter 21 analyzes the complete valuation process for R&D-intensive companies, including adjustments to free cash flow and value.

Nonoperating Charges and Restructuring Reserves

Provisions are noncash expenses that reflect future costs or expected losses. Companies record provisions by reducing current income and setting up a corresponding reserve as a liability (or deducting the amount from the relevant asset).

For the purpose of analyzing and valuing a company, we categorize provisions into one of four types: ongoing operating provisions, long-term operating provisions, nonoperating restructuring provisions, and provisions created

[32]One exception to this conservatism is the development of software. Although software is an intangible asset, GAAP and IFRS accounting allows for certain software investments to be capitalized and amortized over the life of the asset. For UPS, these investments are significant and are already included in invested capital.

for the purpose of smoothing income (transferring income from one period to another). Based on the characteristics of each provision, adjust the financial statements to reflect the company's true operating performance:

- *Ongoing operating provisions:* Operating provisions such as product warranties are part of operations. Therefore, deduct the provision from revenue to determine NOPLAT, and deduct the corresponding reserve from net operating assets to determine invested capital.
- *Long-term operating provisions:* For certain liabilities, such as expected plant decommissioning costs, deduct the operating portion from revenue to determine NOPLAT, and treat the interest portion as nonoperating. Treat the corresponding reserve as a debt equivalent.
- *Nonoperating provisions:* Provisions, such as restructuring charges related to severance, are nonoperating. Treat the expense as nonoperating and the corresponding reserve as a debt equivalent.
- *Income-smoothing provisions:* Provisions for the sole purpose of income smoothing should be treated as nonoperating, and their corresponding reserve as an equity equivalent. Since income-smoothing provisions are noncash, they do not affect value.

The process for classifying and properly adjusting for provisions is explained in more detail in Chapter 19.

Other Adjustments

In addition to the most common adjustments for leases, pensions, R&D, and provisions, a company may have other items that require adjustment. These adjustments arise from an uncommon line item on the income statement or balance sheet and, given their rarity, require thoughtful judgment based on the economic principles of this book.

In the case of FedEx, the company recognized $206 million in deferred gains from aircraft sale/leaseback in the liability section of its 2013 balance sheet (see Exhibit 9.4). Should this item be treated as operating? Or perhaps as a debt or equity equivalent? From a valuation perspective, it doesn't matter how to classify the item, as long as it is treated consistently. It will, however, have an impact on our perceptions about return on invested capital and ultimately value creation. A deferred-gains account arises from the gain on selling an aircraft above its book value. If the same plane is then leased back from the buyer, the company cannot recognize the one-time sale as income, but instead must lower the annual rental expense over the life of the contract. Since cash flows in but retained earnings do not rise, a liability is recognized. Accounting standards are concerned about a spike in net income cause by a financial transaction, but we believe a distortion in rental expense is worse, since this lower

EXHIBIT 9.17 **FedEx: Deferred Gains on Sale/Leaseback**

$ million

	2009	2010	2011	2012	2013
Deferred gains, beginning of year	289	267	246	251	227
New gains on sale/leaseback	–	–	25	–	–
Amortization of past sale/leaseback gains	(22)	(21)	(20)	(24)	(21)
Deferred gains, end of year	267	246	251	227	206

rental expense is noncash and could distort the perspective of rental expense going forward. Therefore, we choose to undo the transaction.

In order to adjust EBITA, the change in deferred gains must be estimated year by year. These estimates are provided in Exhibit 9.17. To reorganize the balance sheet, we treat the account as an equity equivalent. To reorganize the income statement, we increase the rental expense by the amortization expense and increase nonoperating cash flow by the deferral amount.

Using Judgment with Adjustments

Not every advanced issue will lead to material differences in ROIC, growth, and free cash flow. Before collecting extra data and estimating required unknowns, decide whether the adjustment will further your understanding of a company and its industry. An unnecessarily complex model can sometimes obscure the underlying economics that would be obvious in a simple model. Remember, the goal of financial analysis is to provide a strong context for good financial decision making and robust forecasting, not to create an overly engineered model that handles unimportant adjustments.

10

Analyzing Performance

Understanding a company's past is essential to forecasting its future, so a thorough analysis of historical performance is a critical component of valuation. Always begin with the core elements of value creation: return on invested capital (ROIC) and revenue growth. Examine trends in the company's long-run performance and its performance relative to that of its peers, so you can base your forecasts of future cash flows on reasonable assumptions about the company's key value drivers.

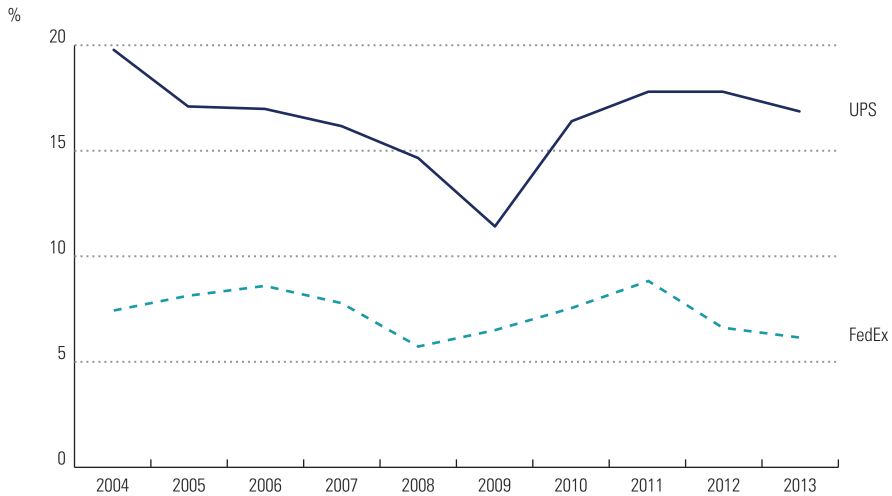
Start by analyzing ROIC, both with and without goodwill. ROIC with goodwill measures the company's ability to create value over and above premiums paid for acquisitions. ROIC without goodwill is a better measure of the company's underlying operating performance compared with that of its peers. Then drill down into the components of ROIC to build an integrated view of the company's operating performance and understand which aspects of the business are responsible for its overall performance. Next, examine the drivers of revenue growth. Does revenue growth stem, for instance, more from organic growth (critical to value creation, as discussed in Chapter 5) or from currency effects, which are largely beyond management control and probably not sustainable? Finally, assess the company's financial health to determine whether it has the financial resources to conduct business and make investments for growth.

ANALYZING RETURNS ON INVESTED CAPITAL

Chapter 9 reorganized the income statement into net operating profit less adjusted taxes (NOPLAT) and the balance sheet into invested capital. ROIC measures the ratio of NOPLAT to invested capital:

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Invested Capital}}$$

EXHIBIT 10.1 **UPS and FedEx: Return on Invested Capital**[1]



[1] ROIC measured with goodwill and acquired intangibles. Goodwill and acquired intangibles do not meaningfully affect ROIC for either company.

Since profit is measured over an entire year, whereas capital is measured only at one point in time, we recommend that you average starting and ending invested capital. In contrast, companies that report ROIC in their annual reports often use starting capital. If new assets acquired during the year generate additional income, however, using starting capital alone will overestimate ROIC. Also, if the business is highly seasonal, such that capital is changing substantially at the company's fiscal close, consider using quarterly averages.

ROIC is a better analytical tool than return on equity (ROE) or return on assets (ROA) for understanding the company's performance because it focuses solely on a company's operations. Return on equity mixes operating performance with capital structure, making peer-group analysis and trend analysis less meaningful. Return on assets (even when calculated on a pre-interest basis) is an inadequate measure of performance because it includes nonoperating assets and ignores the benefits of accounts payable and other operating liabilities that together reduce the amount of capital required from investors.

Exhibit 10.1 plots ROIC for UPS and FedEx from 2004 to 2013 based on the NOPLAT and invested-capital calculations presented in Chapter 9. UPS's ROIC is significantly higher than FedEx's.[1] As we will show later in the chapter, the better returns at UPS can be attributed both to higher margins and to better capital productivity, mostly in long-term assets. Investors have rewarded UPS

[1] In an August 2014 investor presentation, FedEx management stated one financial objective as improving ROIC. In the presentation, FedEx reported fiscal year 2014 ROIC at 8.6 percent and cost of capital equal to 9.3 percent.

for this superior performance. Even though each company generates approximately the same revenue, the enterprise value of UPS traded at that time at roughly double that of FedEx.

Analyzing ROIC with and without Goodwill and Acquired Intangibles

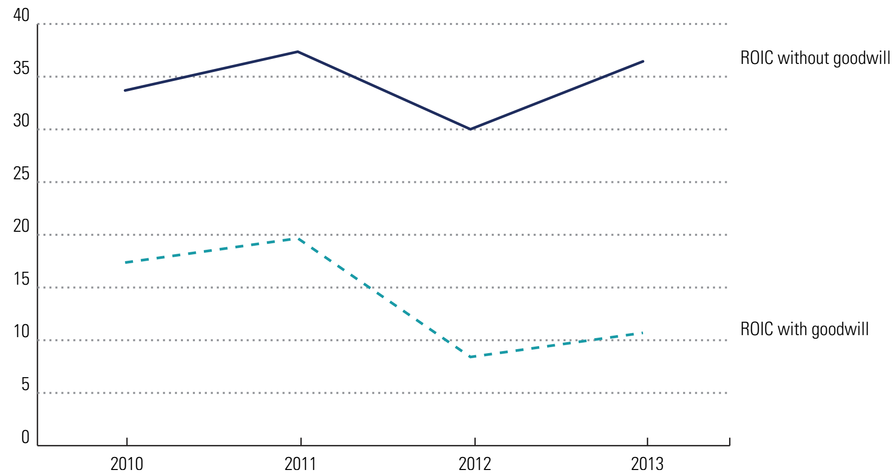
ROIC should be computed both with and without goodwill and acquired intangibles,[2] because each ratio analyzes different things. ROIC excluding goodwill measures the underlying operating performance of a company. It tells you whether the underlying economics generate ROIC above the cost of capital. It can be used to compare performance against that of peers and to analyze trends. It is not affected by the price premiums paid for acquisitions. ROIC with goodwill measures whether the company has earned adequate returns for shareholders, factoring in the price paid for acquisitions. ROIC without goodwill is also more relevant for projecting future cash flows and setting strategy. A company does not need to spend more on acquisitions to grow organically, so ROIC without goodwill is a more relevant baseline for forecasting cash flows. Finally, companies that have high ROIC without goodwill will likely create more value from growth, while companies that have low ROIC without goodwill will likely create more value by improving ROIC.

For both UPS and FedEx, goodwill is a relatively small part of invested capital, but for companies that make significant acquisitions, the difference between ROIC with and without goodwill can be large. Exhibit 10.2 presents ROIC with and without goodwill for the U.S. special-chemicals company Ecolab. In 2011, Ecolab generated a 37.5 percent ROIC without goodwill. That same year, Ecolab purchased Nalco, an industrial water-treatment services company, for $5.4 billion in cash and stock. Since the two companies had quite similar returns on capital, the ROIC without goodwill remained fairly constant following the acquisition. In contrast, ROIC with goodwill fell dramatically after the acquisition, from 19.8 percent in 2011 to 8.4 percent in 2012. Does the significant drop in ROIC when measured with goodwill imply that the acquisition destroyed value? At the time of the deal it was too early to judge: cost savings and cross-selling opportunities take time to realize, so it may take several years for the acquisition's return on capital to exceed its cost of capital.

We've seen situations where a business unit submitted a new strategic plan saying it expected to improve its ROIC over time. On the surface, its forecast looked impressive, but we then discovered that the ROIC included goodwill, and the expected improvement in ROIC would be caused solely by

[2]Goodwill and acquired intangibles are intangible assets purchased in an acquisition. To be classified as an acquired intangible, the asset must be separable and identifiable, as in the case of patents. Goodwill describes assets that are not separable or identifiable. In our analysis, we treat goodwill identically to acquired intangibles. Therefore, we will often shorten the expression *goodwill and acquired intangibles* to *goodwill*.

EXHIBIT 10.2 **Ecolab Inc.: Return on Invested Capital**



goodwill remaining constant as the business grew profits organically. The management team would earn accolades for improving ROIC purely as a result of the accounting for goodwill, not an underlying improvement to the business.

Decomposing ROIC to Develop an Integrated Perspective of Company Economics

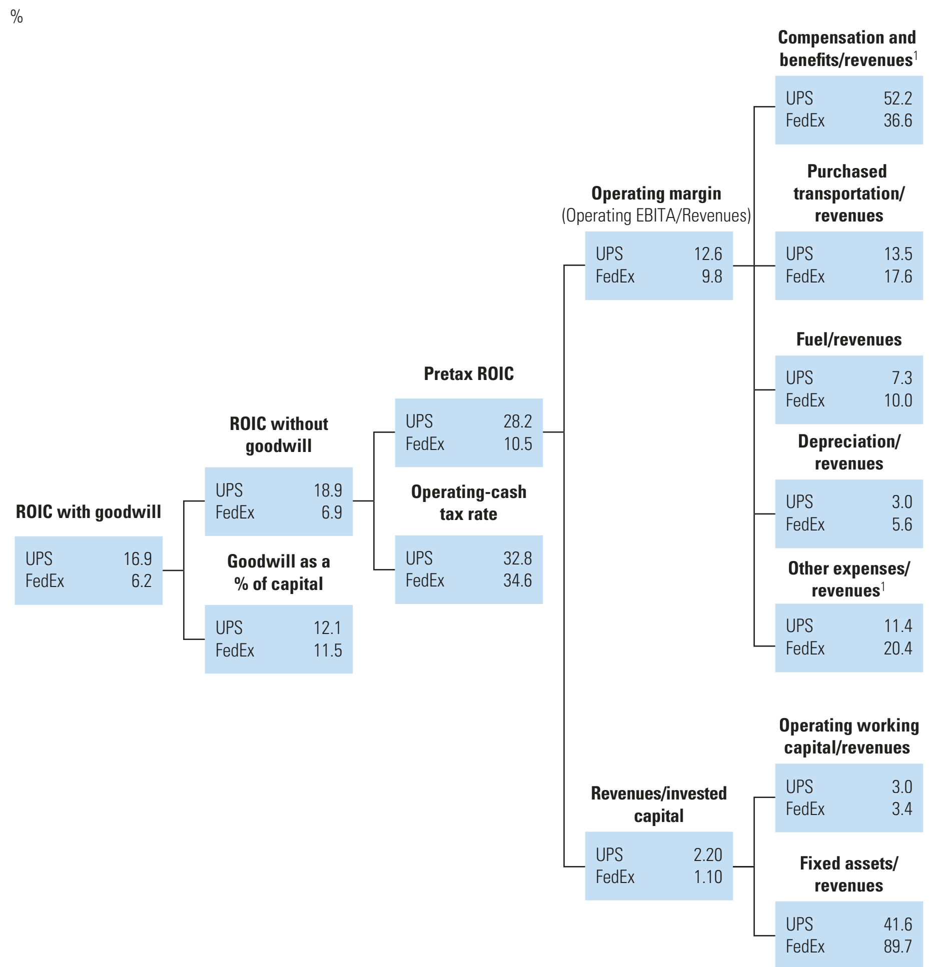
Between 2004 and 2013, UPS earned a higher ROIC than did FedEx. But what caused this difference in performance? To understand which elements of a company's business are driving the company's ROIC, split apart the ratio as follows:

$$\text{ROIC} = (1 - \text{Operating Cash Tax Rate}) \times \frac{\text{EBITA}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Invested Capital}}$$

The preceding equation is one of the most powerful equations in financial analysis. It demonstrates the extent to which a company's ROIC is driven by its ability to maximize profitability (EBITA divided by revenues, or the operating margin), optimize capital turnover (measured by revenues over invested capital), or minimize operating taxes.

Each of these components can be further disaggregated, so that each expense and capital item can be analyzed, line item by line item. Exhibit 10.3 shows how the components can be organized into a tree. On the right side of the tree are operational financial ratios, the drivers of value over which the manager has control. Reading from right to left, each subsequent box is a function

EXHIBIT 10.3 **UPS and FedEx: ROIC Tree, 2013**



[1] Compensation and benefits have been adjusted for nonoperating expenses, such as nonoperating pension expense. Other expenses have been adjusted for operating leases.

of the boxes to its right. For example, operating margin equals 100 percent less the ratios of compensation and benefits to revenues, purchased transportation to revenues, fuel to revenues, depreciation to revenues, and other expenses to revenues. Pretax ROIC equals operating margin times capital turnover (revenues divided by invested capital), and so on.

Once you have calculated the historical drivers of ROIC, compare them with the ROIC drivers of other companies in the same industry. You can then weigh this perspective against your analysis of the industry structure (opportunities for differentiation, barriers to entry or exit, etc.) and a qualitative assessment of the company's strengths and weaknesses.

To illustrate, in 2013, UPS's ROIC (16.9 percent) was nearly three times that of FedEx (6.2 percent). Using the ROIC tree in Exhibit 10.3, we can see that UPS's operating margin was 12.6 percent versus 9.8 percent for FedEx. A direct comparison across companies is imperfect, especially, since their mix of business is different (for example, different proportions of overnight versus ground-based deliveries). The result is that UPS relies more heavily on its own labor force,[3] whereas FedEx relies more heavily on equipment and contractors. This reliance on equipment translates into higher spending for fuel, depreciation, and other expenses (which include landing fees and rental expenses).

Analyzing capital turnover, we see that UPS averages 2.2 times revenue to average invested capital, compared with only 1.1 times for FedEx. For these two companies, capital efficiency derives primarily from the efficiency of fixed assets.

Line item analysis A comprehensive valuation model will convert every line item in the company's financial statements into some type of ratio. For the income statement, most items are taken as a percentage of sales. (Exceptions exist; operating cash taxes, for instance, should be calculated as a percentage of pretax operating profits, not as a percentage of sales.)

For the balance sheet, each line item can also be taken as a percentage of revenues (or as a percentage of cost of goods sold for inventories and payables, to avoid distortion caused by changing prices). For operating current assets and liabilities, you can also convert each line item into days, using the following formula:[4]

$$\text{Days} = 365 \times \frac{\text{Balance Sheet Item}}{\text{Revenues}}$$

The use of days lends itself to a simple operational interpretation. As can be seen in Exhibit 10.4, UPS and FedEx have nearly identical working capital, as measured in days of revenue, although the individual line items of working capital are slightly different.

Operating analysis In an external analysis, ratios are often confined to financial performance. If you are working from inside a company, however, or if the company releases operating data, link operating drivers directly to return on invested capital. By evaluating the operating drivers, you can better assess whether any differences in financial performance between competitors are sustainable.

[3]In 2013, UPS reported 395,000 employees, and FedEx reported 162,000 employees. Since both companies rely heavily on part-time and seasonal employees, it is unclear how many full-time equivalents each employs over the course of a fiscal year.

[4]If the business is seasonal, operating ratios such as inventories should be calculated using quarterly data. The differences can be quite substantial.

EXHIBIT 10.4 **UPS and FedEx: Operating Working Capital in Days**

Number of days, measured in revenue except accounts payable and accrued wages

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
Operating cash	7	7	7	7	7	7
Accounts receivable, net	43	41	43	40	42	44
Other current assets	8	7	6	8	6	6
Operating current assets	58	55	56	56	55	57
Accounts payable[1]	82	81	89	43	50	52
Accrued wages and withholdings[2]	25	26	29	37	37	28
Self-insurance reserves	5	5	5	6	7	6
Other current liabilities	10	10	9	9	9	10
Operating current liabilities	122	122	132	95	103	96
Working capital in days[3]	15	12	11	13	10	15

[1] Days in accounts payable computed using fuel and other expenses, rather than revenues.
[2] Days in accrued wages and withholdings computed using compensation and benefits, rather than revenues.
[3] Days in working capital computed using revenue, not as the difference between asset and liability days.

Consider airlines, which are required for safety reasons to release a tremendous amount of operating data. Exhibit 10.5 details financial and operating data for United Airlines and JetBlue between 2011 and 2013. Operating statistics include the number of employees, measured using full-time equivalents, and available seat-miles (ASMs), the common measurement of capacity for U.S. airlines.

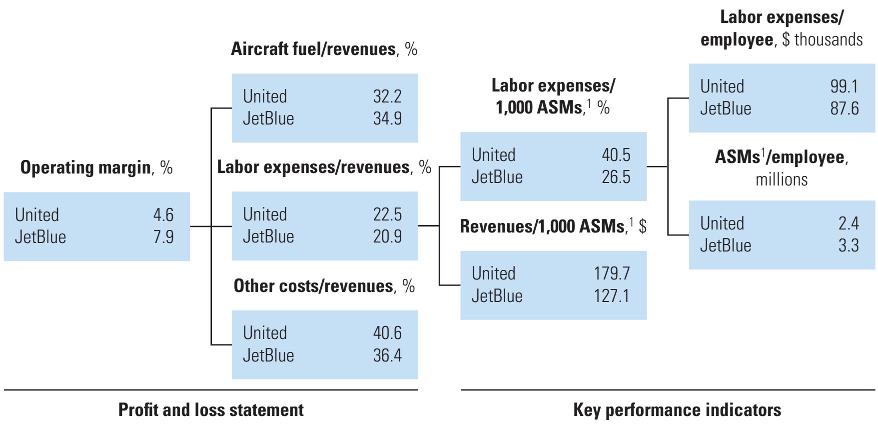
Exhibit 10.6 transforms the data presented in Exhibit 10.5 into the operating-margin branch on the ROIC tree. Operating margin (operating profit divided by revenue) equals 4.6 percent for United Airlines and 7.9 percent for JetBlue. For airlines, operating margin is driven by three primary accounts: aircraft fuel, labor expenses, and other expenses. At first glance, it appears that

EXHIBIT 10.5 **United Airlines and JetBlue: Financial and Operating Statistics**

$ million

	United Airlines			JetBlue		
	2011	2012	2013	2011	2012	2013
Revenues	37,119	37,160	38,287	4,504	4,982	5,441
Aircraft fuel and related taxes	(12,375)	(13,138)	(12,345)	(1,664)	(1,806)	(1,899)
Salaries and related costs	(7,652)	(7,945)	(8,625)	(947)	(1,044)	(1,135)
Other operating expenses	(14,663)	(14,703)	(15,538)	(1,571)	(1,756)	(1,979)
Operating (loss) profit	2,429	1,374	1,779	322	376	428
Operating statistics						
Employees, full-time equivalent	87,000	88,000	87,000	12,133	12,460	12,952
Available seat-miles, millions	219,437	216,330	213,007	37,232	40,075	42,824

EXHIBIT 10.6 **Operating Drivers of Labor Expenses to Revenues, 2013**



[1] Available seat-miles (ASMs) are the standard unit of measure for the U.S. airline industry. Labor expense and revenue ratios measured in cents per mile.

United Airlines and JetBlue have similar labor costs. Labor expenses as a percentage of revenues average 22.5 percent for United Airlines and 20.9 percent for JetBlue. But this statistic is misleading. To see why, disaggregate the ratio of labor expenses to revenue using available seat-miles (ASMs):

$$\frac{\text{Labor Expenses}}{\text{Revenues}} = \left(\frac{\text{Labor Expenses}}{\text{ASMs}}\right) \div \left(\frac{\text{Revenues}}{\text{ASMs}}\right)$$

The ratio of labor expenses to revenues is a function of labor expenses per ASM and revenues per ASM. Labor expenses per ASM are the labor costs required to fly one ASM, and revenues per ASM represent average price charged per ASM. Although United Airlines and JetBlue have similar ratios of labor expenses to revenues, they have different operating models. JetBlue has a 35 percent advantage in labor cost per ASM ($26.5 per thousand ASMs versus $40.5 for United Airlines). But what United Airlines loses in labor costs, it recovers with higher prices. Because of its locations and reach (especially internationally), United can charge an average price 41.5 percent higher than the discount carrier ($179.7 per thousand ASMs versus $127.1 per thousand ASMs).

But what is driving this differential in labor expenses per ASM? Are JetBlue's employees more productive? Or are they paid less? To answer these questions, disaggregate labor expenses to ASMs, using the following equation:

$$\frac{\text{Labor Expenses}}{\text{ASMs}} = \left(\frac{\text{Labor Expenses}}{\text{Employees}}\right) \div \left(\frac{\text{ASMs}}{\text{Employees}}\right)$$

There are two drivers of labor expenses per ASM: the first term represents the average salary per full-time employee; the second measures the productivity of each full-time employee (millions of ASMs flown per employee). The boxes on the right side of Exhibit 10.6 report the calculations for this equation. The average salary is 13.1 percent higher for United Airlines, while productivity per mile is 26.0 percent lower. Although the salary differential appears significant, it is quite small in 2013 compared with the early 2000s, when average salaries differed by a factor of almost 2. Furthermore, the differences in productivity can be driven by different route structures and the level of service provided.

Analyzing performance using operating drivers gives additional insight into the competitive differences among airlines. But the analysis is far from done. In fact, a thoughtful analysis will often raise more questions than answers. For instance, can the salary difference between United Airlines and JetBlue be explained by the mix of employees (pilots are more expensive than gate personnel), or the location of the employees (New York is more expensive than Denver)? Each of these analyses will provide additional insight into the each carrier type's ability to survive and prosper.

ANALYZING REVENUE GROWTH

Chapter 2 determined that the value of a company is driven by ROIC, cost of capital, and growth in cash flows. But what drives long-term growth in cash flows? Assuming profits and reinvestment stabilize at steady rates over the long term, any long-term growth in cash flows will be directly tied to long-term growth in revenues. By analyzing historical revenue growth, you can assess the potential for growth in the future.

The calculation of year-to-year revenue growth is straightforward, but the results can be misleading. Three prime culprits distort revenue growth: the effects of changes in currency values, mergers and acquisitions, and changes in accounting policies. Strip out any distortions created by these effects to arrive at a better forecast of organic revenue growth.

Exhibit 10.7 demonstrates how misleading raw year-to-year revenue growth figures can be. Compass (based in the United Kingdom) and Sodexo (based in France) are global providers of canteen services in businesses, health systems, schools, and sporting venues. In 2012, total revenues at Compass grew by 6.8 percent, and revenues at Sodexo grew by 13.6 percent. The difference in growth rates appears dramatic but is driven primarily by acquisitions, changes in currency values (pounds sterling versus euros), and the one-time benefit for Sodexo of the 2012 Olympic Games, not by long-term stable organic revenue growth. When we strip out these effects, we see that organic revenue growth at Compass (5.4 percent) actually outpaced that of Sodexo (4.5 percent).

EXHIBIT 10.7 **Compass and Sodexo: Revenue Growth Analysis**

%

	Compass			Sodexo		
	2011	2012	2013	2011	2012	2013
Organic revenue growth	5.4	5.4	4.3	5.2	4.5	2.9
Temporary revenue[1]	–	–	–	–	2.0	(1.8)
Currency effects	0.2	(1.1)	(0.6)	0.2	2.7	(0.6)
Acquisitions and divestitures	3.8	2.5	0.2	–	4.4	0.4
Reported revenue growth	9.4	6.8	3.9	5.4	13.6	0.9

[1] Effect of one-time items such as 2012 Olympic Games and 53rd week in United States.

Given swings in currency values and large portfolio changes, historical revenue growth for large multinationals can be extremely volatile, making benchmarking difficult. Reported revenue growth at Compass fell from a high of 9.4 percent in 2011 to just 3.9 percent in 2013. This stands in stark contrast to the relatively stable organic revenue growth between 4.3 and 5.4 percent over the same time period.

The next three sections discuss each distortion in detail and its effect on performance measurement, forecasting, and, ultimately, valuation.

Currency Effects

Multinational companies conduct business in many currencies. At the end of each reporting period, these revenues are converted to the currency of the reporting company. If foreign currencies are rising in value relative to the company's home currency, this translation, at better rates, will lead to higher revenue numbers. Thus, a rise in revenue may not reflect increased pricing power or greater quantities sold, but simply depreciation in the company's home currency.

Compass and Sodexo are two companies exposed to foreign currency. The companies have similar geographic mixes, with nearly half of each company's revenues coming from North America. Since each company translates U.S. dollars into a different currency for its consolidated financial statements, however, exchange rates will affect each company quite differently.

Sodexo translates U.S. dollars from its North American business into euros. Given the weakening of the euro against the U.S. dollar ($1.37 per euro in 2011 versus $1.31 per euro in 2012), Sodexo reported an increase in revenues of 2.7 percent in 2012 attributable to the weakening euro. For Compass, exchange rates had the opposite effect. As the pound strengthened against the dollar, Compass translated revenue from North America into fewer pounds, leading to a 1.1 percent drop in pound-denominated revenue. Movements that helped Sodexo in 2012 reversed themselves in 2013. Failing to acknowledge these currency movements can lead to a critical misunderstanding of a global company's ability to grow organically.

EXHIBIT 10.8 **Effect of Acquisitions on Revenue Growth**

$ million

	Year				
Revenue by company	**1**	**2**	**3**	**4**	**5**
Parent company	100.0	110.0	121.0	133.1	146.4
Target company	20.0	22.0	24.2	26.6	29.3
Consolidated revenues					
Revenue from parent	100.0	110.0	121.0	133.1	146.4
Revenue from target			14.1	26.6	29.3
Consolidated revenues[1]	100.0	110.0	135.1	159.7	175.7
Growth rates, %					
Consolidated revenue growth		10.0	22.8	18.2	10.0
Organic growth		10.0	10.0	10.0	10.0

[1] Only consolidated revenues are reported in a company's annual report.

Mergers and Acquisitions

Growth through acquisition may have very different effects on ROIC than internal growth does because of the sizable premiums a company must pay to acquire another company. Therefore, it is important to understand how companies have been generating historical revenue growth: through organic means or through acquisition.

Many large companies provide data tables such as the one found in Exhibit 10.7. Without voluntary disclosure, though, stripping the effect of acquisitions from reported revenues can be difficult. Unless an acquisition is deemed material by the company's accountants, company filings do not need to detail or even report the acquisition. For larger acquisitions, a company will report pro forma statements that recast historical financials as though the acquisition was completed at the beginning of the fiscal year. Organic revenue growth, then, should be calculated using the pro forma revenue numbers.[5] If the target company publicly reports its own financial data, you can construct pro forma statements manually by combining revenue of the acquirer and target for the prior year. But beware: the bidder will include partial-year revenues from the target for the period after the acquisition is completed. To remain consistent from year to year, reconstructed prior years also must include only partial-year revenue.

Exhibit 10.8 presents the hypothetical purchase of a target company in the seventh month of year 3. Both the parent company and the target are growing organically at 10 percent per year. Whereas the individual companies are

[5] For example, Sodexo purchased Puras, Lenôtre, and Roth Brothers in 2012. Since 2012 includes revenue from the three acquisitions and 2011 does not, the company's consolidated revenue cannot be compared with the prior year's revenue without adjustment.

growing organically at 10 percent each year, consolidated revenue growth is reported at 22.8 percent in year 3 and 18.2 percent in year 4.

To create an internally consistent comparison for years 3 and 4, adjust the prior year's consolidated revenues to match the current year's composition. To do this, add seven months of the target's year 2 revenue (7/12 × \$22 million = \$12.8 million) to the parent's year 2 revenue (\$110.0 million). This leads to adjusted year 2 revenues of \$122.8 million, which matches the composition of year 3. To compute an organic growth rate, divide year 3 revenues (\$135.1 million) by adjusted year 2 revenues (\$122.8 million) to get the correct 10 percent organic growth of the two companies.

Even though the acquisition occurs in year 3, the revenue growth rate for year 4 also will be affected by the acquisition. Year 4 contains a full year of revenues from the target. Therefore, to estimate year 4 organic growth, you must increase year 3 revenue by five months of target revenue (5/12 × \$24.2 million = \$10.1 million).

Accounting Changes and Irregularities

Each year, the Financial Accounting Standards Board (FASB) in the United States and the International Accounting Standards Board (IASB) make recommendations concerning the financial treatment of certain business transactions through either formal standards or topic notes issued by assigned task forces. Changes in a company's revenue recognition policy can significantly affect revenues during the year of adoption, distorting the one-year growth rate.[6] You therefore need to eliminate their effects in order to understand real historical revenue trends.

Consider the new revenue recognition standard IFRS 15, Revenue from Contracts with Customers, which will replace all existing IFRS and GAAP revenue rules in 2017. Under the new standard, companies will follow a new five-step process to determine the allocation of revenue over the life of a contract, implied or written. In some cases, revenues will be delayed to later in the contract, causing a one-time drop in like-for-like revenue. For example, automobile companies that provide free maintenance are likely to see a one-time drop as revenues are delayed. Other industries, including cell phone providers, will see a one-time increase in revenue as cell phone equipment sales can be recognized immediately, rather than over the life of the contract.[7]

If an accounting change is material, a company will document the change in its section on management discussion and analysis (MD&A). For instance, Sodexo specifically called attention to an unusual 53-week year in 2012. The

[6]Revenue recognition changes can also affect margins and capital turnover ratios. They will not, however, affect free cash flow.
[7]F. Norris, "New Standards for Companies' Revenue Accounting Will Begin in 2017," *New York Times*, May 28, 2014.

longer time period in 2012 artificially raised 2012 growth rates, while lowering 2013 growth rates.

Decomposing Revenue Growth to Develop an Integrated Perspective of Company Economics

Once you have removed the effects of mergers and acquisitions, currency translations, and accounting changes from the year-to-year revenue growth numbers, analyze organic revenue growth from an operational perspective. The most standard breakdown is:

$$\text{Revenues} = \frac{\text{Revenues}}{\text{Units}} \times \text{Units}$$

Using this formula, determine whether prices or quantities are driving growth. Do not, however, confuse revenue per unit with price; they can be different. If revenue per unit is rising, the change could be due to rising prices, or the company could be shifting its product mix from low-priced to high-priced items.

The operating statistics that companies choose to report (if any) depend on the industry's norms and competitors' practices. For instance, most retailers provide information on the number of stores they operate, the number of square feet in those stores, and the number of transactions they conduct annually. By relating different operating statistics to total revenues, it is possible to build a deeper understanding of the business.

Consider this retailing standard:

$$\text{Revenues} = \frac{\text{Revenues}}{\text{Stores}} \times \text{Stores}$$

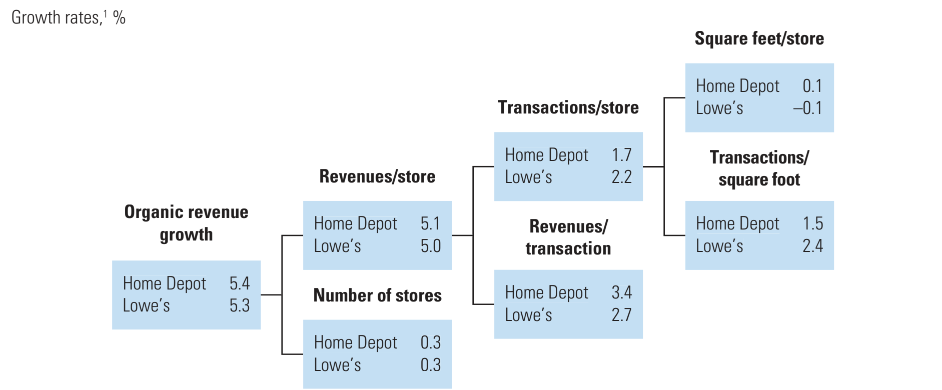
Exhibit 10.9 reports operating statistics for Home Depot and Lowe's, two of the world's largest home improvement stores. For 2013, these figures include data both with and without the effect of Lowe's acquisition of Orchard Supply Hardware, which added 72 stores in September 2013. Using the operating statistics reported in Exhibit 10.9, we discover that Home Depot not only has

EXHIBIT 10.9 **Home Depot and Lowe's: Operating Statistics**

	Home Depot			Lowe's			
	2011	2012	2013	2011	2012	2013[1]	2013
Revenues, $ million	70,395	74,754	78,812	50,208	50,521	53,203.3	53,417
Number of stores[1]	2,252	2,256	2,263	1,745	1,754	1,760.0	1,832
Number of transactions, million	1,318	1,364	1,391	810	804	824.7	828
Square footage at fiscal year-end, million	235	235	236	197	197	197.4	200

[1] Estimated, excluding Lowe's purchase of 72 Orchard Supply Hardware stores in September 2013.

EXHIBIT 10.10 **Home Depot and Lowe's: Organic Revenue Growth Analysis, 2013**



[1] Excluding Lowe's purchase of 72 Orchard Supply Hardware stores in September 2013

more stores than Lowe's, but also generates more revenue per store ($34.8 million per store for Home Depot in 2013 versus $30.2 million for Lowe's). Using the three operating statistics, it is possible to build ratios on revenues per store, transactions per store, square feet per store, dollars per transaction, and number of transactions per square foot.

Although operating ratios are powerful in their own right, what can really change one's thinking about performance is how the ratios change over time. Exhibit 10.10 organizes each ratio into a tree. Rather than report a calculated ratio, such as revenues per store, however, we report the growth in the ratio and relate this back to the growth in revenue.

As the exhibit demonstrates, the drivers of growth are remarkably similar for the two retailers. In contrast to their performance in the prior decade, both companies are now generating nearly all revenue growth from same-store sales, rather than new-store openings. This growth in same-store sales is extremely important, to the point that financial analysts have a special name for growth in revenue per store: *comps*, shorthand for comparables, or year-to-year same-store sales. Why is this revenue growth important? First, the number of stores to open is an investment choice, whereas same-store sales growth reflects each store's ability to compete effectively in its local market. Second, new stores require large capital investments, whereas growth in comps requires little incremental capital. Hence, same-store sales growth comes with higher capital turnover, higher ROIC, and greater value creation.

Moving farther right in the tree, we gain additional insight into what has been driving same-store sales for each company. While Lowe's has increased its transactions per store relative to Home Depot, it has lagged Home Depot in average basket size, as measured by revenue per transaction.

CREDIT HEALTH AND CAPITAL STRUCTURE

To this point, we have focused on the operating performance of the company and its ability to create value. We have examined the primary drivers of value: a company's return on invested capital and organic revenue growth. In the final step of historical analysis, we focus on how the company has financed its operations. What proportion of invested capital comes from creditors instead of from equity investors? Is this capital structure sustainable? Can the company survive an industry downturn? This chapter discusses tools for evaluating a company's capital structure. Chapter 29 examines how capital structure decisions must be an integral part of a company's operating strategy and its plan for how it will return cash to shareholders.

To determine the health of a company's capital structure, the following sections examine two related but distinct concepts: liquidity (via the interest coverage ratio) and leverage. Liquidity measures the company's ability to meet short-term obligations, such as interest expenses, rental payments, and required principal payments. Leverage measures the company's ability to meet obligations over the long term. Since this book's focus is not credit analysis, it details only a few ratios that credit analysts use to evaluate a company's capital structure and credit health.

Coverage

To estimate the company's ability to meet short-term obligations, analysts use ratios that incorporate three measures of earnings:

1. Earnings before interest, taxes, and amortization (EBITA)
2. Earnings before interest, taxes, depreciation, and amortization (EBITDA)
3. Earnings before interest, taxes, depreciation, amortization, and rental expense (EBITDAR)

With the first two earnings measures, you can calculate interest coverage. To do this, divide either EBITA or EBITDA by interest. The first coverage ratio, EBITA to interest, measures the company's ability to pay interest using profits without cutting capital expenditures intended to replace depreciating equipment. The second ratio, EBITDA to interest, measures the company's ability to meet short-term financial commitments using both current profits and the depreciation dollars earmarked for replacement capital. However, although EBITDA provides a good measure of the short-term ability to meet interest payments, most companies cannot compete effectively without replacing worn assets.

EXHIBIT 10.11 **UPS and FedEx: Measuring Coverage**

$ million

	UPS			FedEx		
	2011	2012	2013	2011	2012	2013
EBITA	7,008	7,125	6,973	4,410	4,254	4,447
EBITDA	8,768	8,955	8,820	6,505	6,613	7,011
EBITDAR[1]	9,397	9,574	9,395	8,733	8,866	9,362
Interest	348	393	380	52	82	160
Rental expense	629	619	575	2,228	2,253	2,351
Interest plus rental expense	977	1,012	955	2,280	2,335	2,511
Coverage ratios						
EBITA/interest	20.1	18.1	18.3	84.8	51.9	27.8
EBITDA/interest	25.2	22.8	23.2	125.1	80.6	43.8
EBITDAR/interest plus rental expense	9.6	9.5	9.8	3.8	3.8	3.7
Debt multiples						
Debt to EBITA	2.4	2.3	2.4	5.0	5.9	6.3
Debt to EBITDA	1.9	1.8	1.9	3.4	3.8	4.0
Debt plus leases to EBITDAR	2.4	3.0	2.6	3.2	3.3	3.4

[1] Earnings before interest, taxes, depreciation, amortization, and rental expense.

An alternative is to divide EBITDAR by the sum of interest expense and rental expense. Like the interest coverage ratio, the ratio of EBITDAR to interest expense plus rental expense measures the company's ability to meet its known future obligations, including the effect of operating leases. For many companies, especially retailers and airlines, including rental expenses is a critical part of understanding the financial health of the business.

Exhibit 10.11 presents financial data and coverage ratios for UPS and FedEx. For 2013, UPS's coverage ratio of EBITA to interest equals 18.3 times, whereas FedEx has a ratio of 27.8 times. These ratios are much higher than at many companies, so they indicate a substantial safety net of profits to cover interest. For FedEx, however, this common ratio understates its financial burden because it ignores the company's obligation to pay rent. With rental expense included, the FedEx coverage ratio drops to just 3.7 times, less than half that of UPS.

Over the past decade, interest rates have dropped to unprecedented lows, making interest coverage ratios uncharacteristically high. To evaluate leverage in this low-interest-rate environment, many analysts are now measuring and evaluating debt multiples such as debt to EBITDA or debt to EBITA. Given its much larger denominator, debt to EBITDA tends to be more stable, making assessments over time much clearer.[8] The ratio also does a better job of teasing

[8] In Exhibit 10.11, FedEx reports an EBITA-to-interest coverage ratio that falls from 84.8 in 2011 to 27.8 in 2013. Although this looks quite dramatic, the debt-to-EBITA ratio climbs only slightly from 5.0 to 6.3, while the ratio of debt and leases to EBITDAR barely moves.

out those companies exposed to rollover risk and widening default spreads, neither of which are captured when interest rates are extremely low.

A second reason the debt-to-EBITDA measure has gained in popularity is the increased use of convertible securities. Many convertibles compensate through the potential conversion to equity rather than interest, making interest coverage ratios artificially high. By using the debt-to-EBITDA ratio, one can build a more comprehensive picture of the risk of leverage.

A variation of these debt multiples is the multiple of debt plus leases to EBITDAR. This multiple works best for companies with extensive operating leases, such as FedEx. As Exhibit 10.11 shows, the debt plus leases to EBITDAR is 2.6 times for UPS in 2013, compared with 3.4 times for FedEx. UPS has a more conservative financial structure, even when accounting for operating leases.

Leverage

To better understand the power (and danger) of leverage, consider the relationship between return on equity (ROE) and return on invested capital (ROIC):

$$\text{ROE} = \text{ROIC} + [\text{ROIC} - (1 - T)k_d]\frac{D}{E}$$

As the formula demonstrates, a company's ROE is a direct function of its ROIC, its spread of ROIC over its after-tax cost of debt (k_d), and its book-based debt-to-equity ratio (D/E). Consider a company that is earning an ROIC of 10 percent and has an after-tax cost of debt of 5 percent. To raise its ROE, the company can either increase its ROIC (through operating improvements) or increase its debt-to-equity ratio (by replacing equity with debt). Although each strategy can lead to an identical change in ROE, increasing the debt-to-equity ratio makes the company's ROE more sensitive to changes in operating performance (ROIC). Thus, while increasing the debt-to-equity ratio can increase ROE, it does so by increasing the risks faced by shareholders.

To assess leverage, measure the company's (market) debt-to-equity ratio over time and against peers. Does the leverage ratio compare favorably with the industry? How much risk is the company taking? Chapter 29 offers in-depth answers to these and other questions about leverage.

Payout Ratio

The dividend payout ratio equals total common dividends divided by net income available to common shareholders. We can better understand the company's financial situation by analyzing the payout ratio in relation to its cash flow reinvestment ratio, which we examined earlier:

- If the company has a high dividend payout ratio and a reinvestment ratio greater than 1, then it must be borrowing money to fund negative free cash flow, to pay interest, or to pay dividends. But is this sustainable?
- A company with positive free cash flow and low dividend payout is probably paying down debt (or accumulating excess cash). In this situation, is the company passing up the valuable tax benefits of debt or hoarding cash unnecessarily?

From 2004 to 2013, UPS generated $29 billion in net income and returned $34 billion in dividends and share repurchases. As a result, it has funded growth by increasing debt. Going forward, UPS will likely continue its significant payout policy, but given that share repurchases can be modified, the company retains significant financial flexibility to ramp up investment if the need arises.

Valuation Metrics

To conclude your assessment of capital structure, measure the shareholders' perception of future performance by calculating a market multiple. To build a market multiple, divide core operating value[9] by a normalizing factor, such as revenue, EBITA, or the book value of invested capital. By comparing the multiple of one company versus another, you can examine how the market perceives the company's future relative to other companies.

Exhibit 10.12 presents the operating-value-to-EBITDA multiples for UPS and FedEx between 2004 and 2013.[10] Over that decade, UPS climbed, while FedEx initially fell. In April 2014, UPS traded at 8.7 times EBITDA, versus just 6.4 for FedEx, which could be due to FedEx's lower ROIC.

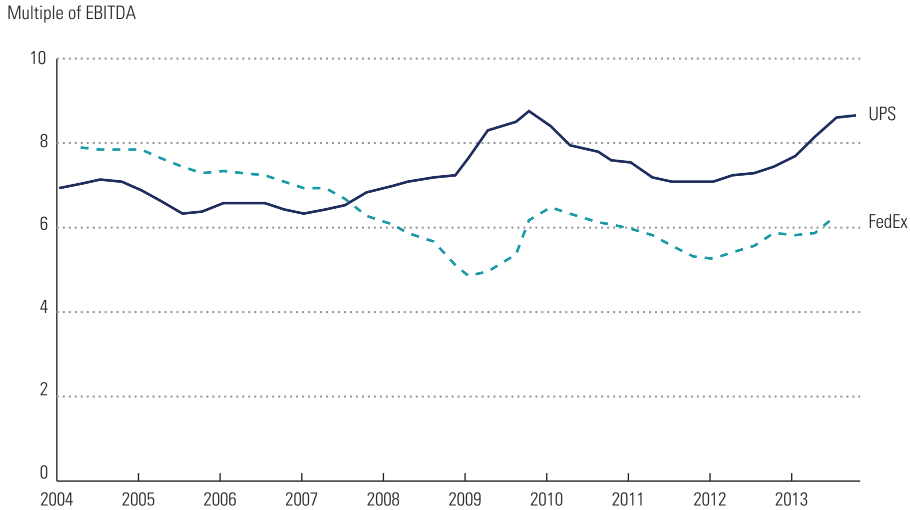
GENERAL CONSIDERATIONS

Although it is impossible to provide a comprehensive checklist for analyzing a company's historical financial performance, here are some guidelines to keep in mind:

[9] In Chapter 8, core operating value is defined as enterprise value less the market value of nonoperating assets, such as excess cash and nonconsolidated subsidiaries.

[10] While operating value to EBITDA is the most common measure of valuation, other measures, including operating value to EBITA and operating value to NOPLAT, often provide helpful insights. For more on valuation multiples, see Chapter 16.

EXHIBIT 10.12 **UPS and FedEx: Operating Value[1] to EBITDA**



[1] Operating value equals enterprise value less the book value of nonoperating assets.

- Look back as far as possible (at least 10 years). Long time horizons will allow you to determine whether the company and industry tend to revert to some normal level of performance, and whether short-term trends are likely to be permanent.
- Disaggregate value drivers—both ROIC and revenue growth—as far as possible. If possible, link operational performance measures with each key value driver.
- If there are any radical changes in performance, identify the source. Determine whether the change is temporary, permanent, or merely an accounting effect.
- If possible, perform your analysis on a granular level, not just on the company as a whole. Real insight comes from analysis of individual business units, product lines, and, if the data exist, even customers.

With historical analysis complete, we now have the appropriate context to build a robust set of forecasts, a critical ingredient of any valuation.

11

Forecasting Performance

This chapter focuses on the *mechanics* of forecasting—specifically, how to develop an integrated set of financial forecasts. We'll explore how to build a well-structured spreadsheet model: one that separates raw inputs from computations, flows from one worksheet to the next, and is flexible enough to handle multiple scenarios. Then we'll discuss the process of forecasting.

To arrive at future cash flow, we forecast the income statement, balance sheet, and statement of retained earnings. The forecast of financial statements provide the information necessary to compute net operating profit less adjusted taxes (NOPLAT), invested capital, return on invested capital (ROIC), and, ultimately, free cash flow (FCF).

While you are building a forecast, it is easy to become engrossed in the details of individual line items. But we stress again that you must place your aggregate results in the proper context. You can do much more to improve your valuation through a careful analysis of whether your forecast of future ROIC is consistent with the company's ability to compete than by precisely (but perhaps inaccurately) forecasting accounts receivable 10 years out.

DETERMINE THE FORECAST'S LENGTH AND DETAIL

Before you begin forecasting individual line items, you must determine how many years to forecast and how detailed your forecast should be. The typical solution, described in Chapter 8, is to develop an explicit year-by-year forecast for a period of time and then to value the remaining years by using a perpetuity formula, such as the key value driver formula introduced in Chapter 2. Whatever perpetuity formula you choose, all the continuing-value approaches assume steady-state performance. Thus, the explicit forecast period must be long enough for the company to reach a steady state, defined by the following characteristics:

- The company grows at a constant rate by reinvesting a constant proportion of its operating profits into the business each year.
- The company earns a constant rate of return on both existing capital and new capital invested.

As a result, free cash flow for a steady-state company will grow at a constant rate and can be valued using a growth perpetuity. The explicit forecast period should be long enough that the company's growth rate is less than or equal to that of the economy. Higher growth rates would eventually make companies unrealistically large relative to the aggregate economy.

In general, we recommend using an explicit forecast period of 10 to 15 years—perhaps longer for cyclical companies or those experiencing very rapid growth. Using a short explicit forecast period, such as five years, typically results in a significant undervaluation of a company or requires heroic long-term growth assumptions in the continuing value. Even so, a long forecast period raises its own issues—namely, the difficulty of forecasting individual line items 10 to 15 years into the future.

To simplify the model and avoid the error of false precision, we often split the explicit forecast into two periods:

1. A detailed five-year to seven-year forecast, which develops complete balance sheets and income statements with as many links to real variables as possible (e.g., unit volumes, cost per unit)
2. A simplified forecast for the remaining years, focusing on a few important variables, such as revenue growth, margins, and capital turnover

Using a simplified intermediate forecast not only simplifies the forecast but also forces you to focus on the business's long-term economics, rather than the individual line items of the forecast. The Heineken case presented in Chapter 24 demonstrates how a two-stage explicit forecast period works.

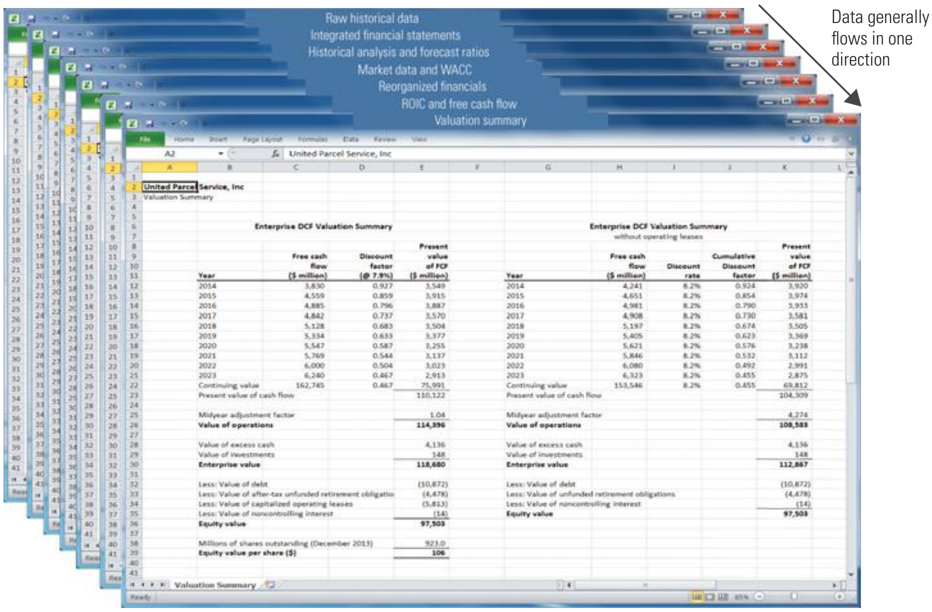
COMPONENTS OF A GOOD MODEL

If you combine 15 years of financial forecasts with 10 years of historical analysis, any valuation spreadsheet becomes complex. Therefore, you need to design and structure your model before starting to forecast. Many designs are possible. In our example (see Exhibit 11.1), the spreadsheet contains seven worksheets:

1. *Raw historical data:* Collect raw data from the company's financial statements, footnotes, and external reports in one place.[1] By keeping the data

[1]For large established companies, data will be substantial. To analyze UPS, we set up separate worksheets for the company's financial statements, note on pensions, note on taxes, and note on intangibles.

EXHIBIT 11.1 **Sample Spreadsheets**



together, you can verify information as needed and update data year by year. Report the raw data in their original form.

2. *Integrated financial statements:* Using figures from the raw-data worksheet, create a set of historical financials that find the right level of detail. As a general rule, operating and nonoperating items should not be aggregated within the same line item. The income statement should be linked with the balance sheet through retained earnings. This worksheet will contain historical and forecast financial statements.
3. *Historical analysis and forecast ratios:* For each line item in the financial statements, build historical ratios, as well as forecasts of future ratios. These ratios will generate the forecast financial statements contained on the previous sheet.
4. *Market data and weighted average cost of capital (WACC):* Collect all financial market data on one worksheet. This worksheet will contain estimates of beta, the cost of equity, the cost of debt, and the weighted average cost of capital, as well as historical market values and trading multiples for the company.
5. *Reorganized financial statements:* Once you have built a complete set of financial statements (both historical and forecast), reorganize the financial statements to calculate NOPLAT, its reconciliation to net income, invested capital, and its reconciliation to total funds invested.

6. *ROIC and FCF:* Use the reorganized financials to build return on invested capital, economic profit, and free cash flow. Future free cash flow will be the basis of your valuation.
7. *Valuation summary:* This worksheet presents discounted cash flows, discounted economic profits, and final results. The valuation summary includes the value of operations, value of nonoperating assets, value of nonequity claims, and resulting equity value.

Well-built valuation models have certain characteristics. First, original data and user input are collected in only a few places. For instance, limit original data and user input to just three worksheets: raw data (worksheet 1), forecasts (worksheet 3), and market data (worksheet 4). To provide additional clarity, denote raw data and user input in a different color from calculations. Second, whenever possible, a given worksheet should feed into the next worksheet. Formulas should not bounce from sheet to sheet without clear direction.[2] Raw data should feed into integrated financials, which in turn should feed into ROIC and FCF. Third, unless specified as data input, numbers should never be hard-coded into a formula. Hard-coded numbers are easily lost as the spreadsheet grows in complexity. Finally, avoid using formulas that come built into the spreadsheet software, such as the net present value (NPV) formula. Built-in formulas can obscure the model's logic and make auditing results difficult.

MECHANICS OF FORECASTING

The enterprise discounted-cash-flow (DCF) valuation model relies on forecast free cash flow (FCF). However, as noted at the beginning of this chapter, FCF forecasts should be created indirectly by first forecasting the income statement, balance sheet, and statement of retained earnings. Compute forecasts of free cash flow in the same way as when analyzing historical performance. A well-built spreadsheet will use the same formulas for historical and forecast ROIC and FCF without any modification.

We break the forecasting process into six steps:

1. *Prepare and analyze historical financials.* Before forecasting future financials, you must build and analyze historical financials.
2. *Build the revenue forecast.* Almost every line item will rely directly or indirectly on revenues. Estimate future revenues by using either a top-down (market-based) or a bottom-up (customer-based) approach. Forecasts should be consistent with historical economy-wide evidence on growth.

[2]Data should always flow in one direction and never loop back to create a circular reference. Circular references will prevent your spreadsheet from calculating results accurately.

3. *Forecast the income statement.* Use the appropriate economic drivers to forecast operating expenses, depreciation, interest income, interest expense, and reported taxes.
4. *Forecast the balance sheet: invested capital and nonoperating assets.* On the balance sheet, forecast operating working capital; net property, plant, and equipment; goodwill; and nonoperating assets.
5. *Reconcile the balance sheet with investor funds.* Complete the balance sheet by computing retained earnings and forecasting other equity accounts. Use excess cash and/or new debt to balance the balance sheet.
6. *Calculate ROIC and FCF.* Calculate ROIC to ensure forecasts are consistent with economic principles, industry dynamics, and the company's ability to compete. To complete the forecast, calculate free cash flow as the basis for valuation. Future FCF should be calculated the same way as historical FCF.

Give extra emphasis to your revenue forecast. Almost every line item in the spreadsheet will be either directly or indirectly driven by revenues, so you should devote enough time to arrive at a good revenue forecast, especially for rapidly growing businesses.

Step 1: Prepare and Analyze Historical Financials

Before starting to build a forecast, input the company's historical financials into a spreadsheet program. To do this, you can rely on data from a professional service, such as Capital IQ, Compustat, or Thomson ONE Banker, or you can use financial statements directly from the company's filings.

Professional services offer the benefit of standardized data (i.e., financial data formatted into a set number of categories). Since data items do not change across companies, a single model that relies on standardized data can analyze any company. However, using a standardized data set carries a cost. Many of the specified categories aggregate important items, hiding critical information. For instance, Compustat groups "advances to sales staff" (an operating asset) and "pension and other special funds" (a nonoperating asset) into a single category titled "other assets." Because of this, models based solely on preformatted data can lead to significant errors in the estimation of value drivers and hence to poor valuations.

Alternatively, you can build a model using financials from the company's annual report. To use raw data, however, you must dig. Often, companies aggregate critical information to simplify their financial statements. Consider, for instance, the financial data for Boeing presented in Exhibit 11.2. On Boeing's reported balance sheet, the company consolidates many items into the account titled "accrued liabilities." In the notes to the balance sheet, note 11, "Liabilities, commitments, and contingencies," details this line item. Some

EXHIBIT 11.2 **Boeing: Current Liabilities in Balance Sheet**

$ million

Balance sheet	**2012**	**2013**
Accounts payable	9,394	9,498
→ Accrued liabilities	12,995	14,131
Advances and billings in excess of related costs	16,672	20,027
Deferred income taxes and income taxes payable	4,485	6,267
Short-term debt and current portion of long-term debt	1,436	1,563
Current liabilities	44,982	51,486
From note 11, Liabilities, commitments, and contingencies		
Accrued compensation and employee benefit costs	5,769	6,158
Environmental	710	649
Product warranties	1,572	1,570
Forward loss recognition	387	360
Dividends payable	367	542
Other	4,190	4,852
Accrued liabilities	12,995	14,131

Source: Boeing Company annual report, 2013.

of the components (such as accounts payable) are operating liabilities, others are debt equivalents (such as environmental remediation), and still others are equity equivalents (such as forward loss recognition). Since the valuation of each of these items requires different treatment, the items must be separated on the extended balance sheet.

We prefer to collect raw data on a separate worksheet. On the raw-data sheet, record financial data as originally reported, and never combine multiple data into a single cell. Once you have collected raw data from the reported financials and notes, use the data to build a set of financial statements: the income statement, balance sheet, statement of retained earnings, and statement of accumulated other comprehensive income. Although the statement of retained earnings appears redundant, it will be critical for error checking during the forecasting process because it connects the income statement to the balance sheet. Accumulated other comprehensive income will be necessary to complete the FCF statement.

As you build the integrated financials, you must decide whether to aggregate immaterial line items. Analyzing and forecasting numerous immaterial items can lead to confusion, introduce mistakes, and cause the model to become unwieldy. Returning to the Boeing example presented in Exhibit 11.2, product warranty liabilities amount to approximately 2 percent of Boeing's revenues.[3]

[3]Contrast this to accrued compensation and employee benefit costs; that account is four times as large as product warranty liabilities and has increased by 7 percent during 2013. Given its size and growth, accrued compensation and employee benefit costs should probably not be aggregated with other liabilities.

Therefore, you might simplify the valuation model (if you desire) by combining these relatively immaterial operating liabilities with other operating liabilities. When aggregating, however, make sure never to combine operating and nonoperating accounts into a single category. If operating and nonoperating accounts are combined, you cannot calculate ROIC and FCF properly.

Step 2: Build the Revenue Forecast

To build a revenue forecast, you can use a *top-down* forecast, in which you estimate revenues by sizing the total market, determining market share, and forecasting prices. Alternatively, with the *bottom-up* approach, you can use the company's own forecasts of demand from existing customers, customer turnover, and the potential for new customers. When possible, use both methods to establish bounds for the forecast.

The top-down approach can be applied to any company. For companies in mature industries, the aggregate market grows slowly and is closely tied to economic growth and other long-term trends, such as changing consumer preferences. In these situations, you can rely on professional forecasts of the aggregate market and focus your own efforts on forecasting market share by competitor.[4] To do this, you must determine which companies have the capabilities and resources to compete effectively and capture share. A good place to start, of course, is with historical financial analysis. But more importantly, make sure to address how the company is positioned for the future. Does it have the required products and services to capture share? Do other competitors have products and services that will displace the company's market position? A good forecast will address each of these issues.

Over the short term, top-down forecasts should build on the company's announced intentions and capabilities for growth. For instance, retailers like Wal-Mart Stores have well-mapped plans for new store openings, which are their primary driver of revenue growth. Oil companies like BP plc have proven reserves and relatively fixed amounts of refining capacity. And pharmaceutical companies like Merck & Company have a fixed set of drugs under patent and in clinical trials.

To value UPS in Chapter 8, we relied on the sell-side analyst community to project company revenue. Exhibit 11.3 presents a revenue forecast by business segment. Using a segment-level forecast for UPS is important because each is growing at a different speed and each has a different operating margin. Although segment revenue forecasts are not often disclosed publicly, some analysts will provide their corporate clients with forecasts for the price and

[4] For the European clothing industry, for instance, Datamonitor publishes the report "Value Clothing in European Retail." This report includes a forecast of store numbers, sales densities, and per capita expenditures for each of the 27 countries of the European Union.

EXHIBIT 11.3 **UPS: Analyst Forecasts of Revenue**

$ million

	Historical			Forecast		
	2011	**2012**	**2013**	**2014**	**2015**	**2016**
U.S. domestic package	31,717	32,856	34,074	35,910	38,014	39,902
International package	12,249	12,124	12,429	13,044	14,106	15,304
Supply chain and freight	9,139	9,147	8,935	9,256	9,748	10,479
Total revenue	53,105	54,127	55,438	58,210	61,868	65,685
Revenue growth, %						
U.S. domestic package	6.6	3.6	3.7	5.4	5.9	5.0
International package	10.0	(1.0)	2.5	4.9	8.1	8.5
Supply chain and freight	5.4	0.1	(2.3)	3.6	5.3	7.5
Total revenue	7.2	1.9	2.4	5.0	6.3	6.2

quantity of packages by segment. Taking a fine-grained look at a company's sources of growth will make clear what drives the company's valuation.

In new-product markets, the top-down approach is especially helpful but often requires more work than for established markets. For instance, consider the fairly recent launch of laptop-tablet hybrid computers, such as the Dell Venue and the Microsoft Surface. Given the lack of history for these products, how do you estimate the potential size and speed of penetration of this market? You could start by sizing the more consumer-oriented tablets of Apple and Samsung. Analyze whether hybrids, given their greater functionality, will be adopted by even more users than consumer-oriented tablets, or perhaps by fewer because of their higher price. Next, forecast how quickly hybrids might penetrate the market. To do this, look at the speed of migration for other electronics going through transition, such as the voice-only cell phone to the smart phone. It is necessary to determine the characteristics that drive penetration speeds in other markets to place your forecast in context. Next, assess the price point and resulting operating margin for the laptop-tablet hybrid. How many companies are developing the product, and how competitive will the market be? As you can see, there are more questions than answers. The key is structuring the analysis and applying historical evidence from comparable markets whenever possible.

Whereas a top-down approach starts with the aggregate market and predicts penetration rates, price changes, and market shares, a bottom-up approach relies on projections of customer demand. In some industries, a company's customers will have projected their own revenue forecasts and can give their suppliers a rough estimate of their own purchase projections. By aggregating across customers, you can determine short-term forecasts of revenues from the current customer base. Next, estimate the rate of customer turnover. If customer turnover is significant, you have to eliminate a portion of estimated revenues. As a final step, project how many new customers the company will attract and how much revenue those customers will contribute. The resulting bottom-up forecast combines new customers with revenues from existing customers.

Regardless of the method, forecasting revenues over long time periods is imprecise. Customer preferences, technologies, and corporate strategies change. These often-unpredictable changes can profoundly influence the winners and losers in the marketplace. Therefore, you must constantly reevaluate whether the current forecast is consistent with industry dynamics, competitive positioning, and the historical evidence on corporate growth. If you lack confidence in your revenue forecast, use multiple scenarios to model uncertainty. Doing this not only will bound the forecast, but also will help company management make better decisions. A discussion of scenario analysis can be found in Chapter 14.

Step 3: Forecast the Income Statement

With a revenue forecast in place, forecast individual line items related to the income statement. To forecast a line item, use a three-step process:

1. *Decide what economic relationships drive the line item*. For most line items, forecasts will be tied directly to revenues. Some line items will be economically tied to a specific asset or liability. For instance, interest income is usually generated by cash and marketable securities; if this is the case, forecasts of interest income should be tied to cash and marketable securities.
2. *Estimate the forecast ratio*. For each line item on the income statement, compute historical values for each ratio, followed by estimates for each of the forecast periods. To get the model working properly, initially set the forecast ratio equal to the previous year's value. The model is likely to change as you learn about the company, so a working model should be your first priority. Once the entire model is complete, return to the forecast page and enter your best estimates.
3. *Multiply the forecast ratio by an estimate of its driver*. Since most line items are driven by revenues, most forecast ratios, such as cost of goods sold (COGS) to revenues, should be applied to estimates of future revenues. This is why a good revenue forecast is critical. Any error in the revenue forecast will be carried through the entire model. Ratios dependent on other drivers should be multiplied by their respective drivers.

Exhibit 11.4 presents the historical income statement and partially completed forecast for a hypothetical company. To demonstrate the three-step process, we forecast cost of goods sold. In the first step, calculate historical COGS as a function of revenues, which equals 37.5 percent. For simplicity, initially

EXHIBIT 11.4 **Partial Forecast of the Income Statement**

Forecast worksheet

%	2014	Forecast 2015
Revenue growth	20.0	20.0
Cost of goods sold/revenues	37.5	37.5
Selling and general expenses/revenues	18.8	
Depreciation$_t$/net PP&E$_{t-1}$[1]	9.5	

Step 1: Choose a forecast driver, and compute historical ratios.

Step 2: Estimate the forecast ratio.

Income statement

$ million	2014	Forecast 2015
Revenues	240.0	288.0
Cost of goods sold	(90.0)	(108.0)
Selling and general expenses	(45.0)	
Depreciation	(19.0)	
EBITA	86.0	
Interest expense	(23.0)	
Interest income	5.0	
Nonoperating income	4.0	
Earnings before taxes	72.0	
Provision for income taxes	(24.0)	
Net income	48.0	

Step 3: Multiply the forecast ratio by next year's estimate of revenues (or appropriate forecast driver).

[1] Net PP&E = net property, plant, and equipment.

set next year's ratio equal to 37.5 percent as well. Finally, multiply the forecast ratio by an estimate of next year's revenues: 37.5 percent × $288 million = $108 million.

Note that we did not forecast COGS by increasing the account by 20 percent (the same growth rate as revenues). Although this process leads to the same *initial* answer, it dramatically reduces flexibility. By using a forecast ratio rather than a growth rate, we can either vary estimates of revenues (and COGS will change in step) or vary the forecast ratio (for instance, to value a potential improvement). If we had increased the COGS directly, however, we could only vary the COGS growth rate.

Exhibit 11.5 presents typical forecast drivers and forecast ratios for the most common line items on financial statements. The appropriate choice for a forecast driver, however, depends on the company and the industry in which it competes.

Operating expenses For each operating expense on the income statement—such as cost of goods sold; selling, general, and administrative expenses; and research and development—we recommend generating forecasts based on revenues. In most cases, the process for operating expenses is straightforward. However, as outlined in Chapter 9, the income statement sometimes embeds certain nonoperating items in operating expenses.

As you would in proper historical analysis, estimate forecast ratios excluding nonoperating items. In 2012, UPS included substantial nonoperating pension charges in reported compensation and benefits, causing the account to rise

EXHIBIT 11.5 **Typical Forecast Drivers for the Income Statement**

	Line item	Typical forecast driver	Typical forecast ratio
Operating	Cost of goods sold (COGS)	Revenue	COGS/revenue
	Selling, general, and administrative (SG&A)	Revenue	SG&A/revenue
	Depreciation	Prior-year net PP&E	$\text{Depreciation}_t/\text{net PP\&E}_{t-1}$
Nonoperating	Nonoperating income	Appropriate nonoperating asset, if any	Nonoperating income/nonoperating asset or growth in nonoperating income
	Interest expense	Prior-year total debt	$\text{Interest expense}_t/\text{total debt}_{t-1}$
	Interest income	Prior-year excess cash	$\text{Interest income}_t/\text{excess cash}_{t-1}$

temporarily. To avoid an artificial change in compensation-to-revenues ratios, adjust the historical account to avoid distortion (see Exhibit 9.9 for the adjusted income statement for UPS). If you cannot adjust the account, estimate future ratios with the distortion in mind.

Depreciation To forecast depreciation, you have three options. You can forecast depreciation as either a percentage of revenues or a percentage of property, plant, and equipment (PP&E), or—if you are working inside the company—you can also generate depreciation forecasts based on equipment purchases and depreciation schedules.

If capital expenditures are smooth, the choice between the first two methods won't matter. But if capital expenditures are lumpy, you will get better forecasts if you use PP&E as the forecast driver. To illustrate this, consider a company that makes a large capital expenditure every few years. Since depreciation is directly tied to a particular asset, it should increase only following an expenditure. If you tie depreciation to sales, it will incorrectly grow as revenues grow, even when capital expenditures haven't been made.

When using PP&E as the forecast driver, forecast depreciation as a percentage of net PP&E, rather than gross PP&E. Ideally, depreciation would be linked to gross PP&E, since depreciation for a given asset's life (assuming straight-line depreciation) equals gross PP&E divided by its expected life. But linking depreciation to gross PP&E requires modeling asset life. Specifically, when assets are fully depreciated they should no longer be depreciated, which can be tricky. To do so would overestimate depreciation (and consequently its tax shield) in the later years.

If you have access to detailed, internal information about the company's assets, you can build formal depreciation tables. For each asset, project depreciation using an appropriate depreciation schedule, asset life, and salvage value.

EXHIBIT 11.6 **Completed Forecast of the Income Statement**

Forecast worksheet

%	2014	Forecast 2015
Revenue growth	20.0	20.0
Cost of goods sold/revenues	37.5	37.5
Selling and general expenses/revenues	18.8	18.8
Depreciation$_t$/net PP&E$_{t-1}$	9.5	9.5
EBITA/revenues	35.8	35.5
Interest rates		
Interest expense	7.6	7.6
Interest income	5.0	5.0
Nonoperating items		
Nonoperating income growth	33.3	33.3
Taxes		
Operating tax rate	34.4	34.4
Statutory tax rate	40.0	40.0
Average tax rate	33.3	33.5

Income statement

$ million	2014	Forecast 2015
Revenues	240.0	288.0
Cost of goods sold	(90.0)	(108.0)
Selling and general expenses	(45.0)	(54.0)
Depreciation	(19.0)	(23.8)
EBITA	86.0	102.3
Interest expense	(23.0)	(22.2)
Interest income	5.0	3.0
Nonoperating income	4.0	5.3
Earnings before taxes (EBT)	72.0	88.4
Provision for income taxes	(24.0)	(29.7)
Net income	48.0	58.8

To determine company-wide depreciation, combine the annual depreciation of each asset.

Exhibit 11.6 presents a forecast of depreciation, as well as the remaining line items on the income statement.

Nonoperating income Nonoperating income is generated by nonoperating assets, such as customer financing, nonconsolidated subsidiaries, and other equity investments. For nonconsolidated subsidiaries and other equity investments, the forecast methodology depends on how much information is reported. For investments in which the parent company owns less than 20 percent, the company records only dividends received and asset sales. The nonoperating asset is recorded at cost, which remains unchanged until sold. For these investments, you cannot use traditional drivers to forecast cash flows; instead, estimate future nonoperating income by examining historical growth in nonoperating income or by examining the revenue and profit forecasts of publicly traded companies that are comparable to the equity investment.

For nonconsolidated subsidiaries with greater than 20 percent ownership, the parent company records income even when it is not paid out. Also, the recorded asset grows as the investment's retained earnings grow. Thus, you can estimate future income from the nonconsolidated investment either by forecasting a nonoperating income growth rate or by forecasting return on equity (nonoperating income as a percentage of the appropriate nonoperating asset) based on industry dynamics and the competitive position of the subsidiary.

EXHIBIT 11.7 **Historical Balance Sheet**

$ million

Assets	2013	2014	Liabilities and equity	2013	2014
Operating cash	5.0	5.0	Accounts payable	15.0	20.0
Excess cash	100.0	60.0	Short-term debt	224.0	213.0
Inventory	35.0	45.0	Current liabilities	239.0	233.0
Current assets	140.0	110.0			
			Long-term debt	80.0	80.0
Net PP&E	200.0	250.0	Common stock	65.0	65.0
Equity investments	100.0	100.0	Retained earnings	56.0	82.0
Total assets	440.0	460.0	Total liabilities and equity	440.0	460.0

Since nonoperating income is typically excluded from free cash flow and the corresponding nonoperating asset is valued separately from core operations, the forecast will not affect the value of core operations. Instead, the primary purposes of nonoperating income forecast are earnings per share estimation and cash flow planning.

Interest expense and interest income Interest expense (or income) should be tied directly to the liability (or asset) that generates the expense (or income). The appropriate driver for interest expense is total debt. Total debt, however, is a function of interest expense, and this circularity leads to implementation problems. To better understand this, consider a rise in operating costs. If the company uses debt to fund short-term needs, total debt will rise to cover the financing gap caused by lower profits. This increased debt load will cause interest expense to rise, dropping profits even further. The reduced level of profits, once again, requires more debt. To avoid the complexity of this feedback effect, compute interest expense as a function of the *prior year's* total debt. This shortcut will simplify the model and minimize implementation error.[5]

To forecast interest expense, the income statement and the balance sheet are needed. The balance sheet for our hypothetical company is presented in Exhibit 11.7. From the income statement, start with the 2014 interest expense of $23 million, and divide by 2013's total debt of $304 million (from the balance sheet), the sum of $224 million in short-term debt plus $80 million in long-term debt. This ratio equals 7.6 percent. To estimate the 2015 interest expense, multiply the estimated forecast ratio (7.6 percent) by 2014's total debt ($293 million), which leads to a forecast of $22.2 million. In this example, interest expense is falling even while revenues rise, because total debt is shrinking as the company generates cash from operations.

[5]If you are using last year's debt multiplied by current interest rates to forecast interest expense, the forecast error will be greatest when year-to-year changes in debt are significant.

Using historical interest rates to forecast interest expense is a simple, straightforward estimation method. And since interest expense is not part of free cash flow, the choice of how to forecast interest expense will not affect the company's valuation (only free cash flow drives valuation; the cost of debt is modeled as part of the weighted average cost of capital). When a company's financial structure is a critical part of the forecast, however, split debt into two categories: existing debt and new debt. Until repaid, existing debt should generate interest expense consistent with contractual rates reported in the company's financial notes. Interest expense based on new debt, in contrast, should be paid at current market rates, available from Bloomberg or another data service. Projected interest expense should be calculated using a yield to maturity for comparably rated debt at a similar duration.

Estimate *interest income* the same way, with forecasts based on the asset generating the income. Be careful: interest income can be generated by a number of different investments, including excess cash, short-term investments, customer financing, and other long-term investments. If a footnote details the historical relationship between interest income and the assets that generate the income (and the relationship is material), develop a separate calculation for each asset.

Provision for income taxes Do not forecast the provision for income taxes as a percentage of earnings before taxes. If you do, ROIC and FCF in forecast years will inadvertently change as leverage and nonoperating income change. Instead, start with a forecast of operating taxes on EBITA, and adjust for nonoperating taxes. Use this combined number to generate taxes on the income statement.

Exhibit 11.8 presents the forecast process for income taxes. To forecast operating taxes for 2015, multiply the *operating* tax rate (34.4 percent) by earnings before interest, taxes, and amortization (EBITA).[6] Earlier, we estimated EBITA equal to $102.3 million for 2015. Do not use the statutory tax rate to forecast operating taxes. Many companies pay taxes at rates below their local statutory rate because of low foreign rates and operating tax credits. Failure to recognize operating credits can cause errors in forecasts of free cash flow. Also, if you use historical tax rates to forecast future tax rates, you implicitly assume that these special incentives will grow in line with EBITA. If this is not the case, EBITA should be taxed at the marginal rate, and tax credits should be forecast one by one.

[6]In Chapter 9, we estimated the operating tax rate using a three-step process. First, we converted the tax reconciliation table to percent (or dollars, if reported in percent). Second, to estimate marginal taxes on EBITA, we multiplied the statutory tax rate found in the tax reconciliation table by EBITA. Third, we added other operating taxes to marginal taxes on EBITA. We found other operating taxes in the dollar-reported tax reconciliation table. To determine the operating tax rate, we divided operating taxes by EBITA.

EXHIBIT 11.8 **Forecast of Reported Taxes**

$ million

		2014	Forecast 2015
	Operating taxes		
	EBITA	86.0	102.3
	× Operating tax rate, %	34.4	34.4
1	= Operating taxes	29.6	35.2
	Nonoperating taxes		
	Interest expense	(23.0)	(22.2)
	Interest income	5.0	3.0
	Nonoperating income	4.0	5.3
	Nonoperating income (expenses), net	(14.0)	(13.8)
	× Marginal tax rate, %	40.0	40.0
2	= Nonoperating taxes	(5.6)	(5.5)
1 + 2	**Provision for income taxes**	**24.0**	**29.7**

Next, forecast nonoperating taxes. Although such taxes are not part of free cash flow, a robust forecast of them will provide insights about future net income and cash needs. For each line item between EBITA and earnings before taxes, compute the marginal taxes related to that item. If the company does not report each item's marginal tax rate, use the country's statutory rate. In Exhibit 11.8, the cumulative net nonoperating expense ($13.8 million in 2015) was multiplied by the statutory tax rate of 40 percent. It is possible to do this because each item's marginal income tax rate is the same. When marginal tax rates differ across nonoperating items, forecast nonoperating taxes line by line.

To determine the 2015 provision for income taxes, sum operating taxes ($35.2 million) and nonoperating taxes (–$5.5 million). You now have a forecast of $29.7 million for reported taxes, calculated such that future values of FCF and ROIC will not change with leverage.

Step 4: Forecast the Balance Sheet: Invested Capital and Nonoperating Assets

To forecast the balance sheet, first forecast invested capital and nonoperating assets. Do not forecast excess cash or sources of financing (such as debt and equity). Excess cash and sources of financing require special treatment and will be handled in step 5.

When forecasting the balance sheet, one of the first issues you face is whether to forecast the line items in the balance sheet directly (in stocks) or indirectly by forecasting changes (in flows). For example, the stock approach forecasts end-of-year receivables as a function of revenues, while the flow

EXHIBIT 11.9 **Stock versus Flow Example**

	Year 1	Year 2	Year 3	Year 4
Revenues, $	1,000	1,100	1,200	1,300
Accounts receivable, $	100	105	117	135
Stock method				
Accounts receivable as a % of revenues	10.0	9.5	9.8	10.4
Flow method				
Change in accounts receivable as a % of the change in revenues	–	5.0	12.0	18.0

EXHIBIT 11.10 **Typical Forecast Drivers for the Balance Sheet**

	Line item	Typical forecast driver	Typical forecast ratio
Operating line items	Accounts receivable	Revenues	Accounts receivable/revenues
	Inventories	Cost of goods sold	Inventories/COGS
	Accounts payable	Cost of goods sold	Accounts payable/COGS
	Accrued expenses	Revenues	Accrued expenses/revenues
	Net PP&E	Revenues	Net PP&E/revenues
Nonoperating line items	Nonoperating assets	None	Growth in nonoperating assets
	Pension assets or liabilities	None	Trend toward zero
	Deferred taxes	Operating taxes or corresponding balance sheet item	Change in operating deferred taxes/ operating taxes, or deferred taxes/ corresponding balance sheet item

approach forecasts the *change* in receivables as a function of the growth in revenues. We favor the stock approach. The relationship between the balance sheet accounts and revenues (or other volume measures) is more stable than that between balance sheet changes and changes in revenues. Consider the example presented in Exhibit 11.9. The ratio of accounts receivable to revenues remains within a tight band between 9.5 percent and 10.4 percent, while the ratio of changes in accounts receivable to changes in revenues ranges from 5 percent to 18 percent.

To forecast the balance sheet, start with items related to invested capital and nonoperating assets. Exhibit 11.10 summarizes forecast drivers and forecast ratios for the most common line items. The three primary operating line items are operating working capital, long-term capital such as net PP&E, and intangible assets related to acquisitions. Nonoperating line items include nonoperating assets, pensions, and deferred taxes, among others. We discuss each category next.

EXHIBIT 11.11 **Partial Forecast of the Balance Sheet**

Forecast worksheet Forecast ratio	2014	Forecast 2015
Working capital		
Operating cash, days' sales	7.6	7.6
Inventory, days' COGS	182.5	182.5
Accounts payable, days' COGS	81.1	81.1
Fixed assets		
Net PP&E/revenues, %	104.2	104.2
Nonoperating assets		
Growth in equity investments, %	0.0	0.0

Balance sheet $ million	2013	2014	Forecast 2015
Assets			
Operating cash	5.0	5.0	–
Excess cash	100.0	60.0	–
Inventory	35.0	45.0	54.0
Current assets	140.0	110.0	–
Net PP&E	200.0	250.0	–
Equity investments	100.0	100.0	100.0
Total assets	440.0	460.0	–
Liabilities and equity			
Accounts payable	15.0	20.0	24.0
Short-term debt	224.0	213.0	–
Current liabilities	239.0	233.0	–
Long-term debt	80.0	80.0	–
Common stock	65.0	65.0	–
Retained earnings	56.0	82.0	–
Total liabilities and equity	440.0	460.0	–

Operating working capital To start the balance sheet, forecast items within operating working capital, such as accounts receivable, inventories, accounts payable, and accrued expenses. Remember, operating working capital excludes any nonoperating assets (such as excess cash) and financing items (such as short-term debt and dividends payable).

When forecasting operating working capital, estimate most line items as a percentage of revenues or in days' sales.[7] Possible exceptions are inventories and accounts payable. Since these two accounts are tied to input prices, estimate them instead as a percentage of cost of goods sold (which is also tied to input prices).[8] To value UPS in Chapter 8, we aligned each working-capital account to its related income statement account. For instance, accrued wages and withholdings were calculated as a percent of compensation and benefits.

Exhibit 11.11 presents a forecast of operating working capital, long-term operating assets, and nonoperating assets (investor funds will be detailed later) for our hypothetical company. All working-capital items are forecast in days, most of which are computed using revenues. Working cash is estimated at 7.6 days' sales, inventory at 182.5 days' COGS, and accounts payable at 81.1

[7] To compute a ratio in days' sales, multiply the percent-of-revenue ratio by 365. For instance, if accounts receivable equal 10 percent of revenues, this translates to accounts receivable at 36.5 days' sales. On average, the company collects its receivables in 36.5 days.

[8] As a practical matter, we often simplify the forecast model by projecting each working-capital item using revenues. The distinction is material only when price is expected to deviate significantly from cost per unit.

days' COGS. We forecast in days for the added benefit of tying forecasts more closely to operations. For instance, if management announces its intention to reduce its inventory holding period from 180 days to 120 days, it is possible to compute changes in value by adjusting the forecast directly.

Property, plant, and equipment Consistent with our earlier argument concerning stocks and flows, net PP&E should be forecast as a percentage of revenues. A common alternative is to forecast capital expenditures as a percentage of revenues. However, this method too easily leads to unintended increases or decreases in capital turnover (the ratio of PP&E to revenues). Over long periods, companies' ratios of net PP&E to revenues tend to be quite stable, so we favor the following three-step approach for PP&E:

1. Forecast net PP&E as a percentage of revenues.
2. Forecast depreciation, typically as a percentage of gross or net PP&E.
3. Calculate capital expenditures by summing the increase in net PP&E plus depreciation.

To continue our example, we use the forecasts presented in Exhibit 11.11 to estimate expected capital expenditures. In 2014, net PP&E equaled 104.2 percent of revenues. If this ratio is held constant for 2015, the forecast of net PP&E equals $300 million. To estimate capital expenditures, compute the increase in net PP&E from 2014 to 2015, and add 2015 depreciation from Exhibit 11.6:

$$\begin{aligned}\text{Capital Expenditures} &= \text{Net PP\&E}_{2015} - \text{Net PP\&E}_{2014} + \text{Depreciation}_{2015}\\ &= \$300.0\text{ million} - \$250.0\text{ million} + \$23.8\text{ million}\\ &= \$73.8\text{ million}\end{aligned}$$

If you forecast net PP&E as a percentage of sales, always calculate and analyze implied capital expenditures. For companies with low growth rates and improvements in capital efficiency, the resulting projections of capital expenditures may be negative (implying asset sales). Although positive cash flows generated by asset sales are possible, they are unlikely.

Goodwill and acquired intangibles A company records goodwill and acquired intangibles when the price it pays for an acquisition exceeds the target's book value.[9] For most companies, we choose not to model potential acquisitions explicitly, so we set revenue growth from acquisitions equal to zero and hold goodwill constant at its current level. We prefer this approach because of

[9]This section refers to acquired intangibles only. Forecast investments in intangibles, such as capitalized software and purchased sales contracts, with the methodology used for capital expenditures and PP&E.

the empirical literature documenting how the typical acquisition fails to create value (any synergies are transferred to the target through high premiums). Since adding a zero-NPV investment will not increase the company's value, forecasting acquisitions is unnecessary. In fact, by forecasting acquired growth in combination with the company's current financial results, you make implicit (and often hidden) assumptions about the present value of acquisitions. For instance, if the forecast ratio of goodwill to acquired revenues implies positive NPV for acquired growth, increasing the growth rate from acquired revenues can dramatically increase the resulting valuation, even when good deals are hard to find.

If you decide to forecast acquisitions, first assess what proportion of future revenue growth they are likely to provide. For example, consider a company that generates $100 million in revenues and has announced an intention to grow by 10 percent annually—5 percent organically and 5 percent through acquisitions. In this case, measure historical ratios of goodwill and acquired intangibles to acquired revenues, and apply those ratios to acquired revenues. For instance, assume the company historically adds $3 in goodwill for every $1 of acquired revenues. Multiplying the expected $5 million of acquired growth by 3, you obtain an expected increase of $15 million in goodwill. Make sure, however, to perform a reality check on your results by varying acquired growth and observing the resulting changes in company value. Confirm that your results are consistent with the company's historical performance concerning recent acquisitions and market-wide empirical evidence.

Nonoperating assets, pensions, and deferred taxes Next, forecast nonoperating assets (such as nonconsolidated subsidiaries and equity investments) and debt and equity equivalents (such as pension liabilities and deferred taxes). Because many nonoperating items are valued using methods other than discounted cash flow (see Chapter 14), we usually create forecasts of these items solely for the purpose of financial planning and cash management, not valuation. For instance, consider unfunded pension liabilities. Assume management announces its intention to reduce unfunded pensions by 50 percent over the next five years. To value unfunded pensions, do not discount the projected outflows over the next five years. Instead, use the current actuarial assessments of the shortfall, which appear in the note on pensions. The rate of reduction will have no valuation implications but will affect the ability to pay dividends or may require additional debt at particular times. To this end, model a reasonable time frame for eliminating pension shortfalls.

We are extremely cautious about forecasting (and valuing) nonconsolidated subsidiaries and other equity investments. Valuations should be based on assessing the investments currently owned, not on discounting the forecast changes in their book values and/or their corresponding income. If a forecast is necessary for planning, keep in mind that income from associates is often noncash, and nonoperating assets often grow in a lumpy fashion unrelated to

EXHIBIT 11.12 **Statement of Retained Earnings**

$ million

	2013	2014	Forecast 2015
Starting retained earnings	36.0	56.0	82.0
Net income	36.0	48.0	58.8
Dividends declared	(16.0)	(22.0)	(26.9)
Ending retained earnings	56.0	82.0	113.8
Dividends/net income, %	44.4	45.8	45.8

a company's revenues. To forecast equity investments, rely on historical precedent to determine the appropriate level of growth.

Regarding deferred-tax assets and liabilities, those used to occur primarily through differences in depreciation schedules (investor and tax authorities use different depreciation schedules to determine taxable income). Today, deferred taxes arise for many reasons, including tax adjustments for pensions, stock-based compensation, acquired-intangibles amortization, and deferred revenues. For sophisticated valuations that require extremely detailed forecasts, forecast deferred taxes line by line, tying each tax to its appropriate driver (see Chapter 18 for an in-depth discussion of deferred taxes). In most situations, forecasting operating deferred taxes by computing the proportion of taxes likely to be deferred will lead to reasonable results. For instance, if operating taxes are estimated at 34.4 percent of EBITA and the company historically could incrementally defer one-fifth of operating taxes paid, we assume it can defer one-fifth of 34.4 percent going forward. Operating-related deferred-tax liabilities will then increase by the amount deferred.

Step 5: Reconcile the Balance Sheet with Investor Funds

To complete the balance sheet, forecast the company's sources of financing. To do this, rely on the rules of accounting. First, use the principle of clean surplus accounting:

$$\begin{aligned}\text{Retained Earnings}_{2015} = {} & \text{Retained Earnings}_{2014} \\ & + \text{Net Income}_{2015} - \text{Dividends}_{2015}\end{aligned}$$

Applying this to our earlier example, Exhibit 11.12 presents the statement of retained earnings. To estimate retained earnings in 2015, start with 2014 retained earnings of $82.0 million from Exhibit 11.11. To this value, add the 2015 forecast of net income: $58.8 million from the income statement in Exhibit 11.6. Next, estimate the dividend payout. In 2014, the company paid out 45.8 percent of net income in the form of dividends. Applying a 45.8 percent payout

EXHIBIT 11.13 **Forecast Balance Sheet: Sources of Financing**

$ million

	2013	2014	Partial 2015	Completed 2015
Assets				
Operating cash	5.0	5.0	6.0	6.0
Excess cash	100.0	60.0	–	35.8
Inventory	35.0	45.0	54.0	54.0
Current assets	140.0	110.0	–	95.8
Net PP&E	200.0	250.0	300.0	300.0
Equity investments	100.0	100.0	100.0	100.0
Total assets	440.0	460.0	–	495.8
Liabilities and equity				
Accounts payable	15.0	20.0	24.0	24.0
Short-term debt	224.0	213.0	213.0	213.0
Current liabilities	239.0	233.0	237.0	237.0
Long-term debt	80.0	80.0	80.0	80.0
Newly issued debt	0.0	0.0	–	0.0
Common stock	65.0	65.0	65.0	65.0
Retained earnings	56.0	82.0	113.8	113.8
Total liabilities and equity	440.0	460.0	–	495.8

Step 1: Determine retained earnings using the clean surplus relationship, forecast existing debt using contractual terms, and keep common stock constant.

Step 2: Test which is higher, assets excluding excess cash, or liabilities and equity excluding newly issued debt.

Step 3: If assets excluding excess cash are higher, set excess cash equal to zero, and plug the difference with the newly issued debt. Otherwise, plug with excess cash.

ratio to estimated net income leads to $26.9 million in expected dividends. Using the clean surplus relationship, we estimate 2015 retained earnings at $113.8 million.

At this point, five line items remain: excess cash, short-term debt, long-term debt, a new account titled "newly issued debt," and common stock. Some combination of these line items must make the balance sheet balance. For this reason, these items are often referred to as "the plug." In simple models, assume common stock remains constant and existing debt either remains constant or is retired on schedule, according to contractual terms. To complete the balance sheet, set one of the remaining two items (excess cash or newly issued debt) equal to zero. Then use the primary accounting identity—assets equal liabilities plus shareholders' equity—to determine the remaining item.

Exhibit 11.13 presents the elements of this process for our example. First, hold short-term debt, long-term debt, and common stock constant. Next, sum total assets, excluding excess cash: cash ($6 million), inventory ($54 million), net PP&E ($300 million), and equity investments ($100 million) total $460 million. Then sum total liabilities and equity, excluding newly issued debt: accounts payable ($24 million), short-term debt ($213 million), long-term debt ($80 million), common stock ($65 million), and retained earnings ($113.8 million) total $495.8 million. Because residual liabilities and equity (excluding newly issued debt) are greater than residual assets (excluding excess cash), newly issued debt is set to zero. Now total liabilities and equity equal \$495.8 million. To ensure that the balance sheet balances, we set the only remaining item, excess cash, equal to \$35.8 million. This increases total assets to \$495.8 million, and the balance sheet is complete.

To implement this procedure in a spreadsheet, use the spreadsheet's prebuilt If function. Set up the function so it sets excess cash to zero when assets (excluding excess cash) exceed liabilities and equity (excluding newly issued debt). Conversely, if assets are less than liabilities and equity, the function should set short-term debt equal to zero and excess cash equal to the difference.

How capital structure affects valuation When using excess cash and newly issued debt to complete the balance sheet, you will likely encounter one common side effect: as growth drops, newly issued debt will drop to zero, and excess cash will become very large.[10] But what if a drop in leverage is inconsistent with your long-term assessments concerning capital structure? From a valuation perspective, this side effect does not matter. Excess cash and debt are not included as part of free cash flow, so they do not affect the enterprise valuation. Capital structure affects enterprise DCF only through the weighted average cost of capital. Thus, only an adjustment to WACC will lead to a change in valuation.

To bring capital structure in the balance sheet in line with capital structure implied by WACC, adjust the dividend payout ratio or amount of net share repurchases. For instance, as the dividend payout is increased, retained earnings will drop, and this should cause excess cash to drop as well. By varying the payout ratio, you can also test the robustness of your FCF model. Specifically, ROIC and FCF, and hence value, should not change when the dividend rate is adjusted.

How you choose to model the payout ratio depends on the requirements of the model. In most situations, you can adjust the dividend payout ratio by hand when needed (remember, the ratio does not affect value but rather brings excess cash and newly issued debt closer to reality). For more complex models, determine net debt (total debt less excess cash) by applying the target net-debt-to-value ratio modeled in the WACC at each point in time. Next, using the target debt-to-value ratio, solve for the required dividend payout. To do this, however, you must perform a valuation in each forecast year and iterate backward—a time-consuming process for a feature that will not affect the final valuation.[11]

[10]Whenever ROIC is greater than revenue growth, a company will generate operating cash flow; that is, the investment rate will be negative. If dividends or share repurchases are not increased to disgorge cash, debt will drop, and/or excess cash will accumulate.

[11]To value UPS in Chapter 8, we modeled a constant leverage ratio year by year and iterated backward. Iteration is required to ensure that the enterprise DCF valuation ties to the cash-flow-to-equity valuation.

Step 6: Calculate ROIC and FCF

Once you have completed your income statement and balance sheet forecasts, calculate ROIC and FCF for each forecast year. This process should be straightforward if you have already computed ROIC and FCF historically. Since a full set of forecast financials is available, merely copy the two calculations across from historical financials to projected financials.

For companies that are creating value, future ROICs should fit one of three general patterns: ROIC should either remain near current levels (when the company has a distinguishable sustainable advantage), trend toward an industry or economic median, or trend to the cost of capital. Think through the economics of the business to decide what is appropriate. For more on long-term trends of ROIC, refer to Chapter 6.

ADDITIONAL ISSUES

The preceding sections detailed the process for creating a comprehensive set of financial forecasts. When forecasting, you are likely to come across three additional issues: forecasting using nonfinancial operating drivers, forecasting using fixed and variable costs, and handling the impact of inflation.

Nonfinancial Operating Drivers

Until now, the chapter has created forecasts that rely solely on financial drivers. In industries where prices are changing or technology is advancing, forecasts should incorporate nonfinancial ratios, such as volume and productivity.

Consider the turmoil in the airline industry during the early 2000s. Fares requiring Saturday-night stays and advance purchases disappeared as competition intensified. Network carriers could no longer distinguish business travelers, their primary source of profit, from leisure travelers. As the average price dropped, costs rose as a percentage of sales. But were airlines truly becoming higher-cost?[12] And how would this trend continue? To forecast changes more accurately, it is necessary to separate price from volume (as measured by seat-miles). Then, instead of forecasting costs as a percentage of revenues, forecast costs as a function of expected quantity—in this case, seat-miles. For instance, rather than forecast fuel cost as a percentage of revenues, project it using gallons of fuel per seat-mile, combined with a market forecast for the price of oil.

The same concept applies to advances in technology. For instance, rather than estimate labor as a percentage of revenues, you could forecast units per employee and average salary per employee. Separating these two drivers

[12] For example, Southwest Airlines dedicates a significantly higher percentage of revenue to labor than Delta Air Lines does. In terms of cost per seat-mile, however, Delta is marginally more expensive.

of labor costs allows you to model a direct relationship between productivity improvements from new technology and estimated changes in units per employee.

Fixed versus Variable Costs

When you are valuing a small project, it is important to distinguish fixed costs (incurred once to create a basic infrastructure) from variable costs (correlated with volume). When you are valuing an individual project, only variable costs should be increased as revenues grow.

At the scale of most publicly traded companies, however, the distinction between fixed and variable costs is often immaterial, because nearly every cost is variable. For instance, consider a mobile-phone company that transmits calls using radio-frequency towers. In spite of the common perception that the tower is a fixed cost, this is true for only a given number of subscribers. As subscribers increase beyond a certain limit, new towers must be added, even in an area with preexisting coverage. (A small company adding 1,000 customers can leverage economies of scale more than a large company adding 100,000 customers.) The same holds true for technology purchases, such as servers, and support functions, such as human resources. What is a fixed cost in the short run for small increases in activity becomes variable over the long run even at reasonable growth rates (10 percent annual growth doubles the size of a company in about seven years). Since corporate valuation is about long-run profitability and growth, nearly every cost should be treated as variable.

When an asset, such as computer software, is truly scalable, it should be treated as a fixed cost. Be careful, however. Many technologies, such as computer software, quickly become obsolete, requiring new incremental expenditures for the company to remain competitive. In this case, a cost deemed fixed actually requires repeated cash outflows.

Inflation

In Chapter 8, we recommended that financial-statement forecasts and the cost of capital be estimated in nominal currency units (with price inflation), rather than real currency units (without price inflation). To remain consistent, the nominally based financial forecast and the nominally based cost of capital must reflect the same expected general inflation rate. This means the inflation rate built into the forecast must be derived from an inflation rate implicit in the cost of capital.[13]

[13]Individual line items may have specific inflation rates that are higher or lower than the general rate, but they should still derive from the general rate. For example, the revenue forecast should reflect the growth in units sold and the expected increase in unit prices. The increase in unit prices, in turn, should reflect the generally expected level of inflation in the economy plus or minus an inflation rate differential

When possible, derive the expected inflation rate from the term structure of government bond rates. The nominal interest rate on government bonds reflects investor demand for a real return plus a premium for expected inflation. Estimate expected inflation as the nominal rate of interest less an estimate of the real rate of interest, using the following formula:

$$\text{Expected Inflation} = \frac{(1 + \text{Nominal Rate})}{(1 + \text{Real Rate})} - 1$$

To estimate expected inflation, start by calculating the nominal yield to maturity on a 10-year government bond. But how do you find the real rate? Starting in 1981, the British government began issuing *linkers*. A linker is a bond that protects against inflation by growing the bond's coupons and principal at the consumer price index (CPI). Consequently, the yield to maturity on a linker is the market's expectation of the real interest rate for the life of the bond. Since the British first introduced inflation-indexed bonds, the European Central Bank and more than 20 countries have followed suit, including the governments of Brazil, Israel, South Africa, and the United States. In November 2014, the yield on a 10-year U.S. Treasury bond equaled 2.30 percent, and the yield on a U.S. Treasury inflation-protected security (TIPS) bond equaled 0.44 percent.[14] Unlike previous decades, when the real rate hovered around 2 percent, the real rate since the financial crisis of 2007–2009 has been near zero. To determine expected inflation, apply the previous formula to the data:

$$\text{Expected Inflation} = \frac{1.0230}{1.0044} = 0.0185$$

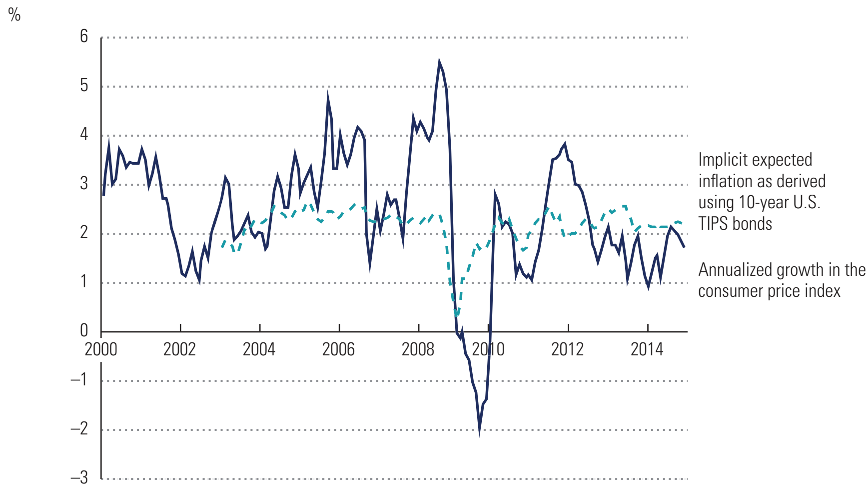
Expected inflation, as measured by the difference in nominal and real bonds, equals 1.85 percent annually over the next 10 years.

Exhibit 11.14 presents annualized growth in the U.S. consumer price index (CPI) versus expected 10-year inflation implied by traditional U.S. Treasury bonds and U.S. TIPS bonds. In the exhibit, expected inflation (as measured by the formula) precedes changes in the actual consumer price index, which is a measure of historical inflation. Since the 10-year TIPS bond is based on long-term inflation, the implied inflation rate is much more stable than the one-year change in CPI (in mid-2008, CPI grew at more than 5 percent when crude oil spiked, only to crater after the recession as companies cut prices to generate demand). During the past five years, actual inflation has yet to match

for that specific product. Suppose general inflation is expected to be 4 percent and unit prices for the company's products are expected to increase at one percentage point less than general inflation. Overall, the company's prices would be expected to increase at 3 percent per year. If we assume a 3 percent annual increase in units sold, we would forecast 6.1 percent annual revenue growth ($1.03 \times 1.03 - 1$).

[14] U.S. Department of the Treasury, Daily Treasury Yield Curve Rates, November 24, 2014.

EXHIBIT 11.14 **Expected Inflation vs. Growth in the Consumer Price Index**



Source: Bloomberg and the Federal Reserve Bank of St. Louis.

higher expectations, as the market predicted a stronger recovery than actually occurred.

Inflation can also distort historical analysis, especially when it exceeds 5 percent annually. In these situations, historical financials should be adjusted to reflect operating performance independent of inflation. We discuss the impact of high inflation rates in Chapter 22.

12

Estimating Continuing Value

As described in Chapter 8, continuing value (CV) provides a useful method for simplifying company valuations. To estimate a company's value, separate a company's expected cash flow into two periods, and define the company's value as follows:

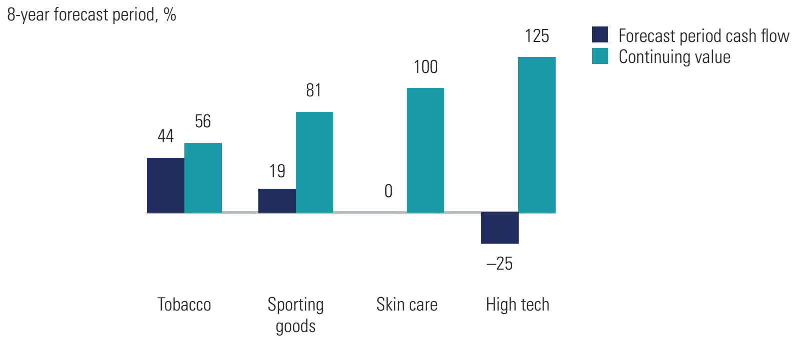
$$\text{Value} = \frac{\text{Present Value of Cash Flow}}{\text{during Explicit Forecast Period}} + \frac{\text{Present Value of Cash Flow}}{\text{after Explicit Forecast Period}}$$

The second term is the continuing value: the value of the company's expected cash flow beyond the explicit forecast period. By deliberately making some simple assumptions about the company's performance during this period (e.g., assuming a constant rate of growth and return on capital), you can estimate continuing value by using formulas instead of explicitly forecasting and discounting cash flows over an extended period.

A thoughtful estimate of continuing value is essential to any valuation, because continuing value often accounts for a large percentage of a company's total value. Exhibit 12.1 shows continuing value as a percentage of total value for companies in four industries, given an eight-year explicit forecast. In these examples, continuing value accounts for 56 percent to 125 percent of total value. These large percentages do not necessarily mean that most of a company's value will be created in the continuing-value period. Often, continuing value is large because profits and other inflows in the early years are offset by outflows for capital spending and working-capital investment—investments that should generate higher cash flow in later years. We discuss the interpretation of continuing value in more detail later in this chapter.

The continuing-value formulas developed over the next few pages are consistent with the discounted-cash-flow (DCF) and economic-profit valuation principles. This is important because continuing value is sometimes treated

EXHIBIT 12.1 **Continuing Value as a Percentage of Total Value**



as though it relies on principles that differ from the DCF of the explicit forecast period. For example, some acquirers estimate continuing value for a target company by applying the same enterprise-value-to-EBITA or enterprise-value-to-EBITDA multiple five years in the future as the multiple they are currently paying for the acquisition target.[1] By doing this, they are assuming that someone would be willing to pay the same multiple for the target company five years from now, regardless of changes in growth and return prospects over that period. This type of circular reasoning leads to inaccurate (and often overly optimistic) valuations. Instead, acquirers should try to estimate what the multiple should be at the end of the forecast period given the company's potential at that time.

This chapter begins with the recommended continuing-value formulas for DCF and economic-profit valuation. It then discusses issues commonly raised about how to interpret continuing value and suggests some best practices in estimating continuing-value parameters such as growth and return on invested capital. Finally, it compares the recommended formulas with other continuing-value techniques and discusses more advanced formulas.

RECOMMENDED FORMULA FOR DCF VALUATION

If you are using the enterprise DCF model, you should estimate continuing value by using the value driver formula derived in Chapter 2:

$$\text{Continuing Value}_t = \frac{\text{NOPLAT}_{t+1}\left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

[1]EBITA equals earnings before interest, taxes, and amortization. EBITDA equals earnings before interest, taxes, depreciation, and amortization.

where $NOPLAT_{t+1}$ = net operating profit less adjusted taxes in the first year after the explicit forecast period

g = expected growth rate in NOPLAT in perpetuity

RONIC = expected rate of return on new invested capital

WACC = weighted average cost of capital

A simple example demonstrates that the value driver formula does, in fact, replicate the process of projecting the cash flows and discounting them to the present. Begin with the following cash flow projections:

	Year 1	Year 2	Year 3	Year 4	Year 5
NOPLAT	\$100.0	\$106.0	\$112.4	\$119.1	\$126.2
Net investment	50.0	53.0	56.2	59.6	63.1
Free cash flow	\$50.0	\$53.0	\$56.2	\$59.6	\$63.1

The same pattern continues in a manner similar to the years presented. In this example, the growth rate in NOPLAT and free cash flow in each period is 6 percent. The rate of return on net new investment is 12 percent, calculated as the increase in NOPLAT from one year to the next, divided by the net investment in the prior year. The weighted average cost of capital (WACC) is assumed to be 11 percent.

To compare the methods of computing continuing value, first discount a long forecast—say, 150 years:[2]

$$CV = \frac{\$50}{1.11} + \frac{\$53}{(1.11)^2} + \frac{\$56}{(1.11)^3} + \ldots + \frac{\$50(1.06)^{149}}{(1.11)^{150}}$$

$$CV = \$999$$

Next, use the growing-free-cash-flow (FCF) perpetuity formula:

$$CV = \frac{\$50}{0.11 - 0.06}$$

$$CV = \$1,000$$

[2]The sum of discounted cash flow will approach the perpetuity value as the forecast period is extended. In this example, a 75-year forecast period will capture 96.9 percent of the perpetuity value, whereas a 150-year forecast period will capture 99.9 percent.

Finally, use the value driver formula:

$$\text{CV} = \frac{\$100\left(1 - \dfrac{0.06}{0.12}\right)}{0.11 - 0.06}$$
$$\text{CV} = \$1{,}000$$

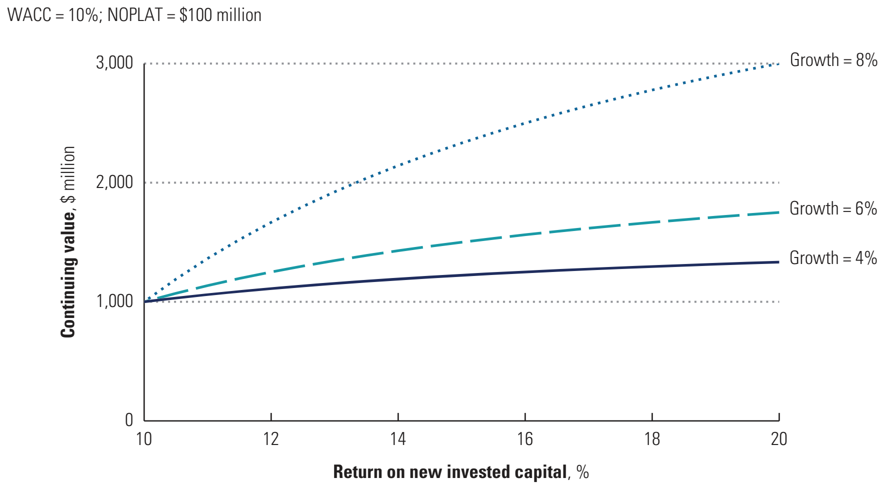
All three approaches yield virtually the same result. (If we had carried out the discounted cash flow beyond 150 years, the result would have been the same.)

Although the value driver formula and the growing-FCF perpetuity formula are technically equivalent, applying the FCF perpetuity formula is tricky, and it is easy to make a common conceptual error by ignoring the interdependence of free cash flow and growth. More specifically, if growth in the continuing-value period is forecast to be lower than the growth at the end of the explicit forecast period (as is normally the case), then the proportion of after-tax operating profit that must be invested is likely to be less, leading to higher free cash flow. If the perpetuity's free cash flow is computed using forecasts from the explicit forecast period, this cash flow will be too low, and the calculation could significantly underestimate the continuing value. Later in this chapter, an example illustrates what can go wrong when using the cash-flow perpetuity formula rather than the key value driver formula.

Because perpetuity-based formulas rely on parameters that never change, use a continuing-value formula only when the company has reached a steady state, with low revenue growth and stable operating margins. Chapters 6 and 7 provide guidance for thinking about return on capital and long-term growth. In addition, when estimating the continuing-value parameters, keep in mind the following technical considerations:

- *NOPLAT:* The level of NOPLAT should be based on a normalized level of revenues and sustainable margin and return on invested capital (ROIC). This is especially important in a cyclical business: revenues and operating margins should reflect the midpoint of the company's business cycle, not its peak or trough.
- *RONIC:* The expected rate of return on new invested capital (RONIC) should be consistent with expected competitive conditions. Economic theory suggests that competition will eventually eliminate abnormal returns, so for companies in competitive industries, set RONIC equal to WACC. However, for companies with sustainable competitive advantages (e.g., brands and patents), you might set RONIC equal to the return the company is forecast to earn during later years of the explicit forecast period. Chapter 6 contains data on the long-term returns on capital for companies in different industries.

EXHIBIT 12.2 **Impact of Continuing-Value Assumptions**



- *Growth rate:* A company's growth rate typically approaches industry growth rates very quickly, and few companies can be expected to grow faster than the economy for long periods. The best estimate is probably the expected long-term rate of consumption growth for the industry's products, plus inflation. Sensitivity analyses also are useful for understanding how the growth rate affects continuing-value estimates. Chapter 7 provides empirical evidence on historical corporate growth rates.
- *WACC:* The weighted average cost of capital should incorporate a sustainable capital structure and an underlying estimate of business risk consistent with expected industry conditions.

The key value driver formula is highly sensitive to the formula's parameters. Exhibit 12.2 shows how continuing value, calculated using the value driver formula, is affected by various combinations of growth rate and RONIC. The example assumes a $100 million base level of NOPLAT and a 10 percent WACC. For RONIC near the cost of capital, there is little change in value as the growth changes. This is because the company is taking on projects whose net present value is close to zero. At an expected RONIC of 14 percent, however, changing the growth rate from 6 percent to 8 percent increases the continuing value by 50 percent, from about $1.4 billion to about $2.1 billion. The higher the RONIC, the more sensitive the continuing value is to changing growth rates.

CONTINUING VALUE USING ECONOMIC PROFIT

With the economic-profit approach, the continuing value does not equal the value of the company following the explicit forecast period, as it does for discounted free cash flow. Instead, it is the incremental value over the company's invested capital at the end of the explicit forecast period. The total value of the company is as follows:

$$\text{Value} = \begin{array}{c}\text{Invested capital at}\\ \text{beginning of forecast}\\ \text{period}\end{array} + \begin{array}{c}\text{Present value of}\\ \text{forecast economic}\\ \text{profit } \textit{during} \text{ explicit}\\ \text{forecast period}\end{array} + \begin{array}{c}\text{Present value of}\\ \text{forecast economic}\\ \text{profit } \textit{after} \text{ explicit}\\ \text{forecast period}\end{array}$$

The economic-profit continuing value is the last term in the preceding equation. Although this continuing value differs from the DCF continuing value, today's value of the company will be the same, given the same projected financial performance.

The economic-profit formula for continuing value is:

$$\begin{aligned} CV_t &= \text{Economic Profits in Year}_{t+1} + \text{Economic Profits beyond Year}_{t+1} \\ &= \frac{IC_t\,(ROIC_t - WACC)}{WACC} + \frac{PV\left(\text{Economic Profit}_{t+2}\right)}{WACC - g} \end{aligned}$$

such that

$$PV(\text{Economic Profit}_{t+2}) = \frac{NOPLAT_{t+1}\left(\frac{g}{RONIC}\right)(RONIC - WACC)}{WACC}$$

where IC_t = invested capital at the end of the explicit forecast period
$ROIC_t$ = ROIC on existing capital at the end of the explicit forecast period
WACC = weighted average cost of capital
g = expected growth rate in NOPLAT in perpetuity
RONIC = expected rate of return on new invested capital after the explicit forecast period

According to the formula, total economic profit following the explicit forecast period equals the present value of economic profit in the first year after the explicit forecast in perpetuity, plus any incremental economic profit after that year. Incremental economic profit is created by additional growth at returns exceeding the cost of capital. If expected RONIC equals WACC, the third term (economic profits beyond year 1) equals zero, and the continuing economic-profit value is the value of the first year's economic profit in perpetuity.

DCF-based and economic-profit-based continuing values are directly related but not identical. The continuing value using DCF will equal the sum of the economic-profit continuing value plus the amount of invested capital in place at the end of the explicit forecast period.

SUBTLETIES OF CONTINUING VALUE

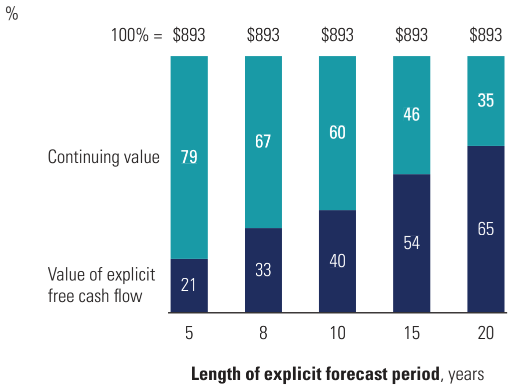
Three misunderstandings about continuing value are common. First is the misperception that the length of the explicit forecast affects the company's value. Second, people confuse return on new invested capital (RONIC) with return on invested capital (ROIC). Setting RONIC equal to WACC in the continuing-value formula does not imply the company will not create value beyond the explicit forecast period. Since return on capital from existing capital will remain at original levels, ROIC will only gradually approach the cost of capital. Finally, some analysts incorrectly infer that a large continuing value relative to the company's total value means that value creation occurs primarily after the explicit forecast period. This makes them uneasy about using enterprise DCF. In this section, we show why these concerns are not necessarily justified, and why continuing value is more robust than often perceived.

Does Length of Forecast Affect a Company's Value?

While the length of the explicit forecast period you choose is important, it does not affect the value of the company; it affects only the distribution of the company's value between the explicit forecast period and the years that follow. In Exhibit 12.3, the value is $893, regardless of how long the forecast period is. With a forecast horizon of five years, the continuing value accounts for 79 percent of total value. With an eight-year horizon, the continuing value accounts for only 67 percent of total value. As the explicit forecast horizon grows longer, value shifts from the continuing value to the explicit forecast period, but the total value always remains the same. To see how the value shift works, compare Exhibits 12.4 and 12.5. Exhibit 12.4 details the calculations for the valuation model using a five-year explicit forecast period, whereas Exhibit 12.5 repeats the analysis with an eight-year period.

In Exhibit 12.4, NOPLAT starts at $100 million. During the first five years, NOPLAT grows at 9 percent per year. Following year 5, NOPLAT growth slows to 6 percent. Using the definition of free cash flow derived in Chapter 9, compute gross cash flow by adding depreciation to NOPLAT. Free cash flow equals gross cash flow minus gross investment. To compute the company's gross

EXHIBIT 12.3 **Comparison of Total-Value Estimates Using Different Forecast Horizons**



Modeling assumptions

	Years 1–5	Years 6+
Growth	9	6
RONIC	16	12
WACC	(12)	(12)
Spread	4	0

EXHIBIT 12.4 **Valuation Using Five-Year Explicit Forecast Period**

$ million

	Year 1	Year 2	Year 3	Year 4	Year 5	Base for CV
NOPLAT	100.0	109.0	118.8	129.5	141.2	149.6
Depreciation	20.0	21.8	23.8	25.9	28.2	
Gross cash flow	120.0	130.8	142.6	155.4	169.4	
Gross investment	(76.3)	(83.1)	(90.6)	(98.7)	(107.6)	
Free cash flow (FCF)	43.8	47.7	52.0	56.7	61.8	
Discount factor	0.893	0.797	0.712	0.636	0.567	
Present value of FCF	39.1	38.0	37.0	36.0	35.0	

Present value of $FCF_{1–5}$	185.1
Continuing value	707.5
Total value	892.6

Calculation of continuing value (CV)

$$CV_5 = \frac{NOPLAT_{CV}\left(1 - \dfrac{g}{RONIC}\right)}{WACC - g} = \frac{\$149.6\left(1 - \dfrac{0.06}{0.12}\right)}{0.12 - 0.06} = \$1{,}246.9$$

$$CV_0 = \frac{CV_5}{(1 + WACC)^5} = \frac{\$1{,}246.9}{(1.12)^5} = \$707.5$$

investment, multiply NOPLAT by the reinvestment rate, where the reinvestment rate equals the ratio of growth to ROIC (9 percent divided by 16 percent), plus depreciation. To determine the present value of the company, sum the present value of the explicit forecast period cash flows plus the present value of continuing value. (Since the continuing value is measured as of year 5, the continuing value of $1,246.9 million is discounted by five years, not by six, a common mistake.) The total value equals $892.6 million.

Exhibit 12.5 details the calculations for a valuation model that uses an eight-year explicit forecast period and a continuing value that starts in year 9. The structure and forecast inputs of the model are identical to those of

EXHIBIT 12.5 **Valuation Using Eight-Year Explicit Forecast Period**

$ million

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Base for CV
NOPLAT	100.0	109.0	118.8	129.5	141.2	149.6	158.6	168.1	178.2
Depreciation	20.0	21.8	23.8	25.9	28.2	29.9	31.7	33.6	
Gross cash flow	120.0	130.8	142.6	155.4	169.4	179.6	190.3	201.7	
Gross investment	(76.3)	(83.1)	(90.6)	(98.7)	(107.6)	(104.7)	(111.0)	(117.7)	
Free cash flow (FCF)	43.8	47.7	52.0	56.7	61.8	74.8	79.3	84.1	
Discount factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404	
Present value of FCF	39.1	38.0	37.0	36.0	35.0	37.9	35.9	34.0	

Present value of FCF_{1-8}	292.9
Continuing value	599.8
Total value	892.6

Calculation of continuing value (CV)

$$CV_8 = \frac{NOPLAT_{CV}\left(1 - \frac{g}{RONIC}\right)}{WACC - g} = \frac{\$178.2\left(1 - \frac{0.06}{0.12}\right)}{0.12 - 0.06} = \$1{,}485.1$$

$$CV_0 = \frac{CV_8}{(1 + WACC)^8} \quad \frac{\$1{,}485.1}{(1.12)^8} \quad \$599.8$$

Exhibit 12.4. In the first five years, growth is 9 percent, and ROIC equals 16 percent. After five years, growth drops to 6 percent, and ROIC drops to 12 percent. This leads to an explicit forecast value of $292.9 million (higher than under the shorter five-year window). Since NOPLAT in the continuing value is higher, continuing value is also higher, but since it occurs three years later, its discounted value is lower.

By comparing the total values calculated in Exhibits 12.4 and 12.5, you can see that the amounts under the two valuation methods are identical. Since the underlying value drivers are the same in both valuations, the results will be the same. The length of your forecast horizon should affect only the proportion of total value allocated between the explicit forecast period and continuing value, not the total value.

The choice of forecast horizon will indirectly affect value if it is associated with changes in the economic assumptions underlying the continuing-value estimate. You can unknowingly change your performance forecasts when you change your forecast horizon. Many forecasters assume that the rate of return on new invested capital will equal the cost of capital in the continuing-value period, but that the company will earn returns exceeding the cost of capital during the explicit forecast period. By extending the explicit forecast period, you also implicitly extend the time period during which returns on new capital are expected to exceed the cost of capital. Therefore, extending the forecast period indirectly raises the value.

So how do you choose the appropriate length of the explicit forecast period? The explicit forecast period should be long enough that the business will have reached a steady state by the end of the period. Suppose you expect the company's margins to decline as its customers consolidate. Margins are currently 12 percent, and you forecast they will fall to 9 percent over the next seven years. In this case, the explicit forecast period must be at least seven years because continuing-value approaches cannot account for the declining margin (at least not without complex computations). The business must be operating at an equilibrium level for the continuing-value approaches to be useful. If the explicit forecast period is more than seven years, there will be no effect on the total value of the company.

How Long Is the Competitive-Advantage Period?

A related, but very subtle, issue is the concept of a company's competitive-advantage period, or period of supernormal returns. This is the notion that companies will earn returns above the cost of capital for a period of time, followed by a decline to the cost of capital. While this concept is useful, linking it to the length of the forecast is dangerous. One reason is simply that, as we just showed, there is no direct connection between the length of the forecast and the value of a company.

More important is that the length of competitive advantage is sometimes inappropriately linked to the explicit forecast period. Remember, the key value driver formula is based on incremental returns on capital, not company-wide average returns. If you set RONIC in the continuing-value period equal to the cost of capital, you are *not* assuming that the return on total capital (old and new) will equal the cost of capital. The *original* capital (prior to the continuing-value period) will continue to earn the returns projected in the last forecast period. In other words, the company's competitive-advantage period has not come to an end once the continuing-value period is reached. For example, imagine a retailer whose early stores are located in high-traffic, high-growth areas. The company's early stores earn a superior rate of return and fund ongoing expansion. But as the company grows, new locations become difficult to find, and the ROIC related to expansion starts to drop. Eventually, the ROIC on the newest store will approach the cost of capital. But does this imply ROIC on early stores will drop to the cost of capital as well? Probably not. A great location is hard to beat.

Exhibit 12.6 shows the implied average ROIC, assuming that projected continuing-value growth is 4.5 percent, the return on base capital is 18 percent, RONIC is 10 percent, and WACC is 10 percent. Note how the average return on all capital declines only gradually. From its starting point at 18 percent, it declines to 14 percent (the halfway point to RONIC) after 10 years in the continuing-value period. It reaches 12 percent after 21 years, and 11 percent after 37 years.

EXHIBIT 12.6 **Gradual Decline in Average ROIC According to Continuing-Value Formula**

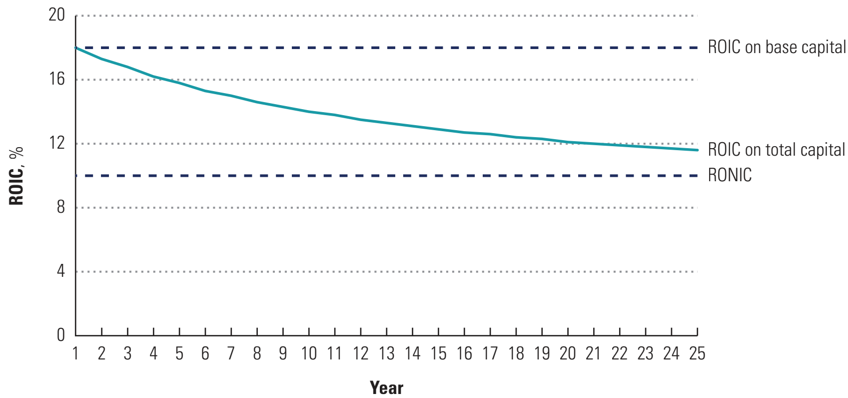
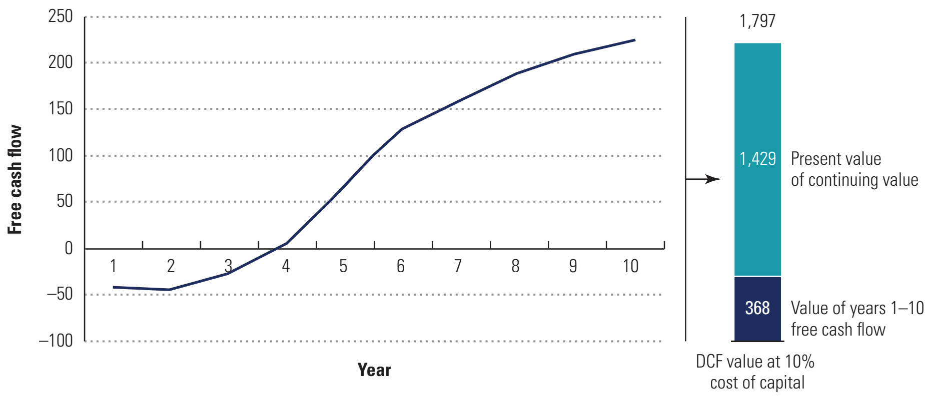


EXHIBIT 12.7 **Innovation, Inc.: Free Cash Flow Forecast and Valuation**

$ million



When Is Value Created?

Executives often state uncomfortably that "all the value is in the continuing value." Exhibit 12.7 illustrates the problem for a hypothetical company, Innovation, Inc. Based on discounted free cash flow, it appears that 80 percent of Innovation's value comes from the continuing value. But there are other interesting ways to interpret the source of value.

Exhibit 12.8 suggests an alternative: a business components approach. Innovation, Inc. has a base business that earns a steady 20 percent return on capital and is growing at 5 percent per year. It also has developed a new product line that will require several years of negative cash flow for development

EXHIBIT 12.8 **Innovation, Inc.: Valuation by Components**

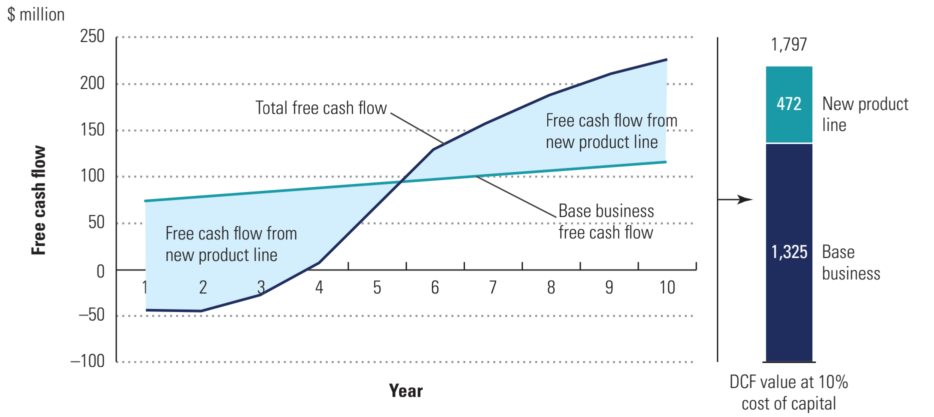
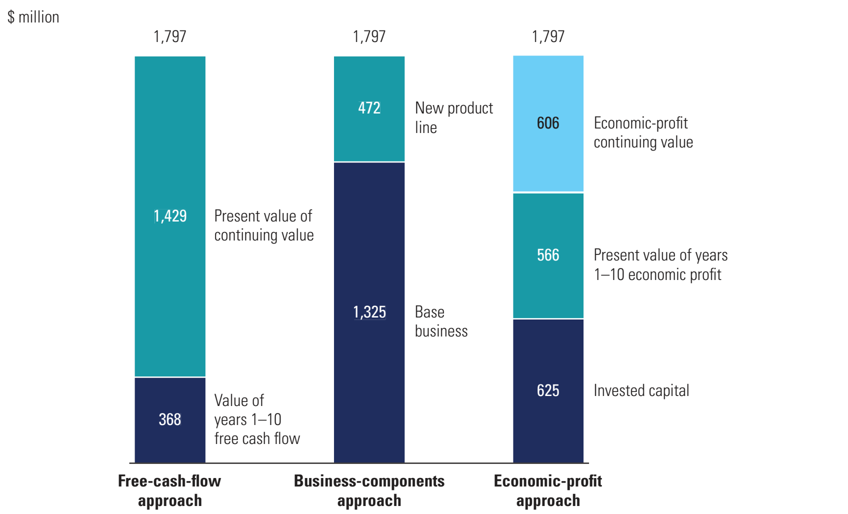


EXHIBIT 12.9 **Innovation, Inc.: Comparison of Continuing-Value Approaches**



of a new sales channel, which management hopes will lead to organic growth. As shown in Exhibit 12.8, the base business has a value of $1,325 million or 74 percent of Innovation's total value. In other words, 74 percent of the company's value comes from operations that are currently generating strong, stable cash flow. Only 26 percent of total value is attributable to the unpredictable growth business. When the situation is viewed this way, uncertainty plays only a small role in the total value.

It is possible to use the economic-profit model to generate another interpretation of continuing value. Exhibit 12.9 compares the components of value for

EXHIBIT 12.10 **Correct and Incorrect Methods of Forecasting Base FCF**

$ million

	Year 9	Year 10	Year 11, 5% growth: Incorrect	Year 11, 5% growth: Correct
Revenues	1,000	1,100	1,155	1,155
Operating expenses	(850)	(935)	(982)	(982)
EBITA	150	165	173	173
Operating taxes	(60)	(66)	(69)	(69)
NOPLAT	90	99	104	104
Depreciation	27	30	32	32
Gross cash flow	117	129	136	136
Capital expenditures	(30)	(33)	(35)	(35)
→ Increase in working capital	(27)	(30)	(32)	(17)
Gross investment	(57)	(63)	(67)	(52)
Free cash flow	60	66	69	84
Supplemental calculations				
Working capital, year-end	300	330	362	347
Working capital/revenues, %	30.0	30.0	31.3	30.0

Innovation, Inc., using the discounted-FCF approach, the business components approach, and an economic-profit model. Under the economic-profit model, 35 percent of Innovation's value is simply the book value of invested capital. The rest of the value, $1,172 million, is the present value of projected economic profit, and of that, only 34 percent of total value is generated during the continuing-value period—a much smaller share than under the discounted-FCF model.

COMMON PITFALLS

Estimating a company's performance 10 to 15 years out is not a precise process. Common mistakes in estimating continuing value include naive base-year extrapolation and both naive and purposeful overconservatism.

Naive Base-Year Extrapolation

Exhibit 12.10 illustrates a common error in forecasting the base level of free cash flow: assuming that the investment rate is constant, so that NOPLAT, investment, and FCF all grow at the same rate. From year 9 to year 10 (the last forecast year), the company's earnings and cash flow grow by 10 percent. It is believed that revenue growth in the continuing-value period will be 5 percent per year. A common, yet incorrect, forecast for year 11 (the continuing-value base year) simply increases every line item from year 10 by 5 percent, as shown in the third column. This forecast is wrong because the increase in working capital is far too large, given the projected increase in sales. Since revenues are growing more slowly, the proportion of gross cash flow devoted to increasing working capital should decline significantly, as shown in the last column. In the final column, the increase in working capital should be the amount necessary to maintain the year-end working capital at a constant percentage of revenues.

The naive approach continually increases working capital as a percentage of revenues (5 percent) and will significantly understate the value of the company. Note that in the third column, free cash flow is 18 percent lower than it should be. The same problem applies to capital expenditures. However, we limited the example to working capital to keep it simple.

To avoid making an error in estimating final-year cash flow, we recommend using the value driver formula instead of the cash-flow perpetuity model. The value driver model implicitly computes the required investment based on expectations of growth and ROIC.

Naive Overconservatism

Many financial analysts routinely assume that the incremental return on capital during the continuing-value period will equal the cost of capital. This practice relieves them of having to forecast a growth rate, since growth in this case neither adds nor destroys value. For some businesses, this assumption is too conservative. For example, both Coca-Cola's and PepsiCo's soft-drink businesses earn high returns on invested capital, and their returns are unlikely to fall substantially as they continue to grow, due to the strength of their brands, high barriers to entry, and limited competition. For these businesses, an assumption that RONIC equals WACC would understate their values.[3] This problem applies equally to almost any business selling a product or service that is unlikely to be duplicated, including many pharmaceutical companies, numerous consumer products companies, and some software companies.

However, even if RONIC remains high, growth will drop as the market matures. Therefore, any assumption that RONIC is greater than WACC should be coupled with an economically reasonable growth rate.

Purposeful Overconservatism

Analysts sometimes are overly conservative because of the uncertainty and size of the continuing value. But if continuing value is to be estimated properly, the uncertainty should cut both ways: the results are just as likely to be higher

[3]In this example, RONIC equaling WACC is unlikely because of economic reasons. RONIC may also permanently exceed the cost of capital because capital is systematically understated. Under current accounting standards, only physical (or contractual) investment is capitalized on the balance sheet. Companies that have valuable brands, distribution, and intellectual property do not recognize their investment on the balance sheet unless acquired. For more on how to compute invested capital for companies with large intangible assets, see Chapter 21.

EXHIBIT 12.11 **Continuing-Value Estimates for a Sporting Goods Company**

Technique	Assumptions	Continuing value, $ million
Other DCF approaches		
Perpetuity based on final year's NOPLAT	Normalized NOPLAT growing at inflation rate	582
Perpetuity based on final year's cash flow	Normalized FCF growing at inflation rate	428
Multiples (comparables)		
Price-to-earnings ratio	Industry average of 15.0 times earnings	624
Market-to-book ratio	Industry average of 1.4 times book	375
Asset-based valuations		
Liquidation value	80% of working capital	186
	70% of net fixed assets	
Replacement cost	Book value adjusted for inflation	275

than an unbiased estimate as they are to be lower. So conservatism overcompensates for uncertainty. Uncertainty matters, but it should be modeled using scenarios, not through conservatism regarding ROIC or growth.

EVALUATING OTHER APPROACHES TO CONTINUING VALUE

Several alternative approaches to continuing value are used in practice, often with misleading results. A few approaches are acceptable if used carefully, but we prefer the methods recommended earlier, because they explicitly rely on the underlying economic assumptions embodied in the company analysis. Other approaches tend to obscure the underlying economic assumptions. Using the example of a sporting goods company, Exhibit 12.11 illustrates the wide dispersion of continuing-value estimates arrived at by different techniques.

The most common techniques fall into three categories: (1) other DCF approaches, (2) multiples, and (3) asset-based valuations. This section describes techniques in these categories and explains why we prefer the recommended approaches.

Other DCF Approaches

The recommended DCF formulas can be modified to derive additional continuing-value formulas with more restrictive (and sometimes unreasonable) assumptions.

One variation is the *convergence* formula. For many companies in competitive industries, we expect that the return on net new investment will eventually converge to the cost of capital as all the excess profits are competed away. This assumption allows a simpler version of the value driver formula, as follows:

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}}{\text{WACC}}$$

The derivation begins with the value driver formula:

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}\left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

Assume that RONIC = WACC (that is, the return on incremental invested capital equals the cost of capital):

$$\begin{aligned}\text{CV} &= \frac{\text{NOPLAT}_{t+1}\left(1 - \dfrac{g}{\text{WACC}}\right)}{\text{WACC} - g}\\ &= \frac{\text{NOPLAT}_{t+1}\left(\dfrac{\text{WACC} - g}{\text{WACC}}\right)}{\text{WACC} - g}\end{aligned}$$

Canceling the term WACC – g leaves a simple formula:

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}}{\text{WACC}}$$

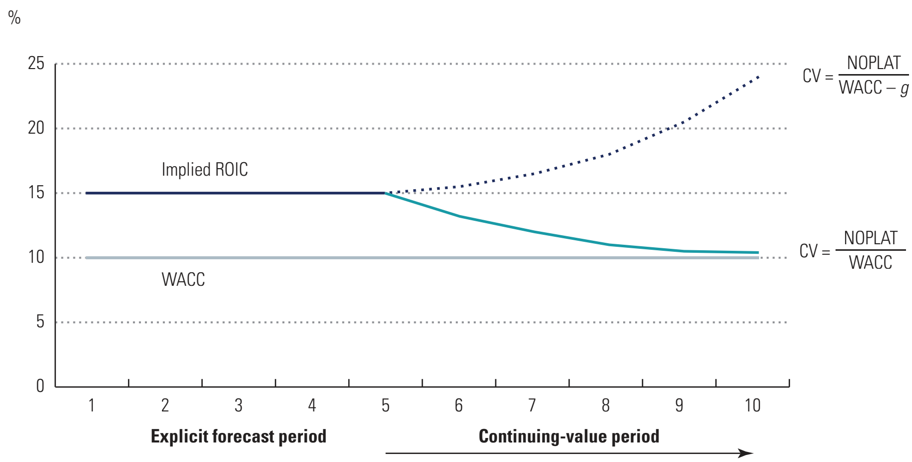
The fact that the growth term has disappeared from the equation does *not* mean that the nominal growth in NOPLAT will be zero. The growth term drops out because new growth adds nothing to value, as the RONIC associated with growth equals the cost of capital. This formula is sometimes interpreted as implying zero growth (not even with inflation), but this is not an accurate interpretation.

Misinterpretation of the convergence formula has led to another variant: the *aggressive-growth* formula. This formula assumes that earnings in the continuing-value period will grow at some rate, most often the inflation rate. The analyst then concludes that earnings should be discounted at the real WACC rather than the nominal WACC. The resulting formula is:

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}}{\text{WACC} - g}$$

Here, g is the inflation rate. This formula can substantially overstate continuing value because it assumes that NOPLAT can grow without *any* incremental

EXHIBIT 12.12 **Rates of Return Implied by Alternative Continuing-Value Formulas**



capital investment. This is unlikely (or impossible), because any growth will probably require additional working capital and fixed assets.

To see the critical assumption hidden in the preceding formula, we analyze the key value driver formula as RONIC approaches infinity:

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}\left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

$$\text{RONIC} \rightarrow \infty, \text{ therefore } \frac{g}{\text{RONIC}} \rightarrow 0$$

$$\text{CV} = \frac{\text{NOPLAT}_{t+1}(1 - 0)}{\text{WACC} - g}$$

$$= \frac{\text{NOPLAT}_{t+1}}{\text{WACC} - g}$$

Exhibit 12.12 compares the two variations of the key value driver formula, showing how the average return on invested capital (both existing and new investment) behaves under the two assumptions. In the aggressive-growth case, NOPLAT grows without any new investment, so the return on invested capital eventually approaches infinity. In the convergence case, the average return on invested capital moves toward the weighted average cost of capital as new capital becomes a larger portion of the total capital base.

Multiples

Multiples, also known as comparables, assume that a company will be worth some multiple of future earnings or book value in the continuing period. But how do you estimate an appropriate future multiple?

A common approach is to assume that the company will be worth a multiple of earnings or book value based on the multiple for the company today. Suppose we choose today's current industry average price-to-earnings (P/E) ratio. This ratio reflects the economic prospects of the industry during the explicit forecast period as well as the continuing-value period. In maturing industries, however, prospects at the end of the explicit forecast period are likely to be very different from today's. Therefore, a different P/E is needed that reflects the company's prospects at the end of the forecast period. What factors will determine that ratio? As discussed in Chapter 2, the primary determinants are the company's expected growth, the rate of return on new capital, and the cost of capital. The same factors are in the key value driver formula. Unless you are comfortable using an arbitrary P/E, you are much better off with the value driver formula.

When valuing an acquisition, companies sometimes fall into the circular reasoning that the P/E for the continuing value should equal the P/E paid for the acquisition. In other words, if I pay 18 times earnings today, I should be able to sell the business for 18 times earnings at the end of the explicit forecast period. In most cases, the reason a company is willing to pay a particular P/E for an acquisition is that it plans to improve the target's earnings. So the effective P/E it is paying on the improved level of earnings will be much less than 18. Once the improvements are in place and earnings are higher, buyers will not be willing to pay the same P/E unless they can make *additional* improvements. Chapter 16 describes other common mistakes made when using multiples.

Asset-Based Valuations

Unlike the previous methods, which rely on future cash flow or earnings, replacement cost and liquidation value are asset-based valuation approaches. These approaches ignore the future potential of the company. Therefore, use them only in situations where ongoing operations are in jeopardy. The liquidation value approach sets the continuing value equal to the estimated proceeds from the sale of the assets, after paying off liabilities at the end of the explicit forecast period. Liquidation value is often far different from the value of the company as a going concern. In a growing, profitable industry, a company's liquidation value is probably well below the going-concern value. In a dying industry, liquidation value may exceed going-concern value. Do not use this approach unless liquidation is likely at the end of the forecast period.

The replacement cost approach sets the continuing value equal to the expected cost to replace the company's assets. This approach has at least two drawbacks. First, not all tangible assets are replaceable. The company's organizational capital can be valued only on the basis of the cash flow the company generates. The replacement cost of just the company's tangible assets may greatly understate the value of the company.

Second, not all the company's assets will ever be replaced. Consider a machine used only by this particular industry. As long as it generates a positive cash flow, the asset is valuable to the ongoing business of the company. But the replacement cost of the asset may be so high that replacing it is not economical. Here, the replacement cost may exceed the value of the business as an ongoing entity.

ADVANCED FORMULAS FOR CONTINUING VALUE

In certain situations, you may want to break up the continuing-value (CV) period into two periods with different growth and ROIC assumptions. You might assume that during the first eight years after the explicit forecast period, the company will grow at 8 percent per year and earn an incremental ROIC of 15 percent. After those eight years, the company's growth rate will slow to 5 percent, and incremental ROIC will drop to 11 percent. In a situation such as this, you can use a two-stage variation of the value driver formula for DCF valuations:

$$\mathrm{CV} = \left[\frac{\mathrm{NOPLAT}_{t+1}\left(1 - \dfrac{g_\mathrm{A}}{\mathrm{RONIC}_\mathrm{A}}\right)}{\mathrm{WACC} - g_\mathrm{A}}\right]\left[1 - \left(\frac{1 + g_\mathrm{A}}{1 + \mathrm{WACC}}\right)^N\right] + \frac{\mathrm{NOPLAT}_{t+1}(1 + g_\mathrm{A})^N\left(1 - \dfrac{g_\mathrm{B}}{\mathrm{RONIC}_\mathrm{B}}\right)}{(\mathrm{WACC} - g_\mathrm{B})(1 + \mathrm{WACC})^N}$$

where N = number of years in the first stage of the CV period
g_A = expected growth rate in the first stage of the CV period
g_B = expected growth rate in the second stage of the CV period
$\mathrm{RONIC}_\mathrm{A}$ = expected return on new invested capital during the first stage of the CV period
$\mathrm{RONIC}_\mathrm{B}$ = expected return on new invested capital during the second stage of the CV period

Note that g_A can take any value; it does not have to be less than the weighted average cost of capital. Conversely, g_B must be less than WACC for this perpetuity formula to be valid. (Otherwise the formula goes to infinity, and the company eventually becomes the entire world economy.)

A two-stage variation can also be used for the economic-profit continuing-value formula:[4]

$$\text{CV} = \frac{\text{Economic Profit}_{t+1}}{\text{WACC}} + \left[\frac{\text{NOPLAT}_{t+1}\left(\dfrac{g_A}{\text{RONIC}_A}\right)(\text{RONIC}_A - \text{WACC})}{\text{WACC}(\text{WACC} - g_A)}\right]\left[1 - \left(\frac{1 + g_A}{1 + \text{WACC}}\right)^N\right] + \frac{\text{NOPLAT}(1 + g_A)^N\left(\dfrac{g_B}{\text{RONIC}_B}\right)(\text{RONIC}_B - \text{WACC})}{\text{WACC}(\text{WACC} - g_B)(1 + \text{WACC})^N}$$

These formulas always assume that the return on the base level of capital remains constant at the level of the last year of the explicit forecast. If you want to model a decline in ROIC for all capital, including the base level of capital, it is best to model this into the explicit forecast.

It is difficult to model changes in average ROIC with formulas, because the growth rate in revenues and NOPLAT will not equal the growth rate in FCF, and there are multiple ways for the ROIC to decline. You could model declining ROIC by setting the growth rate for capital and reducing NOPLAT over time (in which case NOPLAT will grow much more slowly than capital). Or you could set the growth rate for NOPLAT and adjust FCF each period (so FCF growth again will be slower than NOPLAT growth). The dynamics of these relationships are complex, and we do not recommend embedding the dynamics in continuing-value formulas, especially when the key value drivers become less transparent.

CLOSING THOUGHTS

The future is inherently unknowable, so it is quite understandable why many finance professionals are skeptical about enterprise DCF models that rely on a continuing-value formula. This skepticism may be warranted in some cases, but for many valuations, disaggregating the continuing value into its economic components can show why these concerns are overstated. Remember, the value

[4]Thanks to Peter de Wit and David Krieger for deriving this formula.

of a company is merely its invested capital plus the economic profits it generates on that capital. If the majority of value creation occurs during the explicit forecast period, then the continuing value plays a much smaller role than the free cash flow would lead you to believe.

Regardless of the relative importance of continuing value, follow a few simple guidelines for successful valuation. First, use the key value driver formula to estimate continuing value. Unlike the free cash flow model, the value driver formula implicitly models the correct investment required for growth. Second, carefully assess the value drivers at the time of continuing value. The value drivers should be consistent with the company's potential in the future, rather than today's performance or economic environment. We believe a thoughtful analysis will lead to insights not available with other models.

13

Estimating the Cost of Capital

To value a company using enterprise discounted cash flow (DCF), discount your forecast of free cash flow (FCF) at the weighted average cost of capital (WACC). The WACC represents the returns that all investors in a company, equity and debt, expect to earn for investing their funds in one particular business instead of others with similar risk, also referred to as their opportunity cost. Since a company's investors will earn the cost of capital if the company meets expectations, the cost of capital is used interchangeably with expected return.

The weighted average cost of capital (WACC) has three primary components: the cost of equity, the after-tax cost of debt, and the company's target capital structure. Estimating WACC is difficult because there is no way to directly measure an investor's cost of capital, especially the cost of equity. Furthermore, many of the traditional approaches that worked for years have been complicated by the impact of the financial crisis of 2007–2009 and the monetary policies that have led to unusually low interest rates on government bonds. To estimate the cost of capital, we employ various models and approximations that are grounded in corporate finance theory and also build on empirical observations about the market value of companies. These models estimate the expected return on alternative investments with similar risk.

This chapter begins with a brief summary of the WACC calculation, and then presents detailed sections on how to estimate its components: the cost of equity, cost of debt, and target capital structure, respectively. The chapter concludes with a discussion of WACC estimation for companies whose capital structure is complex.

WEIGHTED AVERAGE COST OF CAPITAL

In its simplest form, the weighted average cost of capital equals the weighted average of the after-tax cost of debt and cost of equity:[1]

$$\text{WACC} = \frac{D}{V}k_d(1 - T_m) + \frac{E}{V}k_e$$

where D/V = target level of debt to enterprise value using market-based (not book) values
E/V = target level of equity to enterprise value using market-based values
k_d = cost of debt
k_e = cost of equity
T_m = company's marginal income tax rate

The cost of equity is determined by estimating the expected return on the market portfolio, adjusted for the risk of the company being valued. In this book, we use the capital asset pricing model (CAPM) to estimate a company's risk adjustment factor. The CAPM adjusts for company-specific risk through the use of beta, which measures how a company's stock price responds to movements in the overall market. Since a high correlation between a stock and the market increases the volatility of the market portfolio, investors require a high return to hold that stock. Consequently, stocks with high betas have expected returns that exceed the market return; the converse is true for low-beta stocks. Only beta risk is priced. Any remaining risk, which academics call idiosyncratic risk, can be diversified away by holding multiple securities (as explained in Chapter 3). In practice, measurements of beta are highly imprecise. Therefore, use a set of peer company betas adjusted for financial leverage to estimate a company's beta.

To approximate the after-tax cost of debt for an investment-grade firm, use the company's after-tax yield to maturity (YTM) on its long-term debt. For companies whose debt trades infrequently, or for nontraded debt, use the company's debt rating to estimate the yield to maturity. Since free cash flow is measured without interest tax shields, use the after-tax cost of debt to incorporate the tax shield into the WACC.

Finally, weight the after-tax cost of debt and cost of equity using target levels of debt and equity to the total enterprise value of the company. For mature

[1] For companies with other securities, such as preferred stock, additional terms must be added to the cost of capital, representing each security's expected rate of return and percentage of total enterprise value. The cost of capital does not include expected returns of operating liabilities, such as accounts payable. Required compensation for capital provided by customers, suppliers, and employees is included in operating expenses, so it is already incorporated in free cash flow. Including operating liabilities in the WACC would incorrectly double-count their cost of financing.

EXHIBIT 13.1 **UPS: Weighted Average Cost of Capital**

%

Source of capital	Proportion of total capital	Cost of capital	Marginal tax rate	After-tax cost of capital	Contribution to weighted average
Debt	15.0	4.9	37.1	3.1	0.5
Equity	85.0	8.9		8.9	7.5
WACC	100.0				8.0

companies, the target capital structure is often approximated by the company's current debt-to-value ratio, using market values of debt and equity. As we'll explain later in this chapter, do not use book values.

Exhibit 13.1 presents the WACC calculation for UPS. We estimate the company's cost of equity using the CAPM, which leads to a cost of equity of 8.9 percent. To estimate UPS's pretax cost of debt, we use the December 2013 yield to maturity on A+ rated debt, which equals 4.9 percent. In Chapter 9, we estimated UPS's marginal tax rate at 37.1 percent, so the company's after-tax cost of debt equals 3.1 percent. Finally, we assume UPS will maintain its current debt-to-value ratio of 15 percent going forward. Adding the weighted contributions from debt and equity, WACC equals 8.0 percent.

Always estimate the WACC in a manner consistent with the principles of free cash flow. For example, since free cash flow is the cash flow available to all financial investors, the company's WACC must also include the expected return for each class of investor. In general, the cost of capital must meet the following criteria:

- It must include the cost of capital for all investors—debt, preferred stock, common stock, and so on—since free cash flow is available to all investors, who expect compensation for the risks they take.
- Any financing-related benefits or costs, such as interest tax shields, not included in free cash flow must be incorporated into the cost of capital or valued separately using adjusted present value.[2]
- It must be computed after corporate income taxes (since free cash flow is calculated in after-tax terms).
- It must be based on the same expectations of inflation as those embedded in forecasts of free cash flow.

[2]For most companies, discounting forecast free cash flow at a constant WACC is a simple, accurate, and robust method of arriving at a corporate valuation. If, however, the company's target capital structure is expected to change significantly—for instance, in a leveraged buyout—WACC can overstate (or understate) the impact of interest tax shields. In this situation, you should discount free cash flow at the unlevered cost of equity and value tax shields and other financing effects separately (as described in Chapter 8).

- The duration of the securities used to estimate the cost of capital must match the duration of the cash flows.

ESTIMATING THE COST OF EQUITY

The cost of equity is the most difficult component of WACC to estimate. Academics and practitioners have proposed numerous models to estimate the cost of equity, but none have been universally accepted. Furthermore, the dot-com crash of 2001 and the financial crisis of 2007–2009 have made estimation of the key ingredients a very serious challenge.

With these hurdles in mind, we estimate the cost of equity in two steps. First, we estimate the expected return on the entire stock market. Although a particular company will not necessary have the same return as the market, the market return provides a critical benchmark for judging how reasonable estimates of individual companies are, a problem that has been particularly acute over the past 15 years. We next measure company risk using one of two well-known models, the capital asset pricing model (CAPM) and the Fama-French three-factor model. Each model measures company risk by measuring the correlation of its stock price to market changes, known as beta. Since estimates of beta are imprecise, we rely on peer group betas, rather than individual company betas.

Estimating the Market Return

Each and every day, thousands of investors attempt to estimate the market's expected return. Since the future is unobservable, many practitioners use one of two approaches to estimate it. The first method looks backward using historical market returns. But given that past market returns are heavily influenced by the rate of inflation prevalent at the time, a simple average of past returns isn't helpful. Instead, we add a historical market risk premium to today's interest rate, which incorporates today's expected inflation.

A second method calculates the cost of equity implied by the relationship between current share prices and aggregate fundamental performance (earnings, return on invested capital [ROIC], and growth expectations). By valuing a large sample of companies like the Standard & Poor's (S&P) 500 index using discounted cash flow, we can reverse engineer the embedded cost of equity. Although the method requires a forecast of future performance, it is quite powerful, since it incorporates up-to-date market prices.

Using the historical market risk premium The first method to estimate the future market return starts by examining historical data on market returns. Rather than take a historical average of past market returns, add a risk premium to today's long-term government bond rate. In this way, the estimate of

EXHIBIT 13.2 **Cumulative Returns for Various Intervals, 1900–2014**

Arithmetic mean, %

	Average cumulative returns			Annualized returns	
Holding period	U.S. stocks	U.S. government bonds	U.S. excess returns	U.S. excess returns	Blume estimate of market risk premium
1 year	11.4	5.5	6.4	6.4	6.4
2 years	24.1	11.2	12.7	6.2	6.3
4 years	52.1	23.7	25.4	5.8	6.3
5 years	68.6	30.8	32.6	5.8	6.3
10 years	175.4	73.8	71.6	5.5	6.2

Source: Dimson, Marsh, and Staunton (1900–2002) and Morningstar SBBI (2003–2014).

the future market return incorporates current interest and inflation rates, rather than those in the past.

Estimating the historical risk premium properly requires some statistical sophistication. A full description of the most relevant issues is available in Appendix F; we offer only a summary here. First, use as long a time period as possible. Our work relies on research by Elroy Dimson, Paul Marsh, and Mike Staunton, who provide market returns back to 1900.[3] Although many argue that market risk premiums have dropped over time, a simple regression analysis does not confirm this. Therefore, we believe more data improves the quality of estimation. Second, neither the arithmetic average nor a geometric average of past returns will estimate multiyear forecasts well. The best value falls somewhere between the two averages. While the arithmetic average is best for perfectly measured average returns, compounding the average return also compounds any estimation error, causing the number to be too high. To counter this bias, Marshall Blume created an estimator using a combination of the two averages.[4]

Exhibit 13.2 presents the average cumulative returns of the U.S. stock market, the U.S. bond market, and excess returns (stocks minus bonds) between 1900 and 2014. Using five- to 10-year holding periods, the average annual excess return is 5.5 to 5.8 percent. Blume's estimator for longer-date cash flows is slightly higher, at just above 6 percent. Even with the best statistical techniques, however, this number is probably too high, because the observable sample includes only countries with strong historical returns.[5] Statisticians refer to this phenomenon as survivorship bias. Zvi Bodie writes, "There were 36 active stock markets in 1900, so why do we only look at two, [the UK and

[3]E. Dimson, P. Marsh, and M. Staunton, "The Worldwide Equity Premium: A Smaller Puzzle," in *Handbook of Investments: Equity Risk Premium*, ed. R. Mehra (Amsterdam: Elsevier Science, 2007).
[4]D. C. Indro and W. Y. Lee, "Biases in Arithmetic and Geometric Averages as Estimates of Long-Run Expected Returns and Risk Premia," *Financial Management* 26, no. 4 (Winter 1997): 81–90; and M. E. Blume, "Unbiased Estimators of Long-Run Expected Rates of Return," *Journal of the American Statistical Association* 69, no. 347 (September 1974): 634–638.
[5]S. Brown, W. Goetzmann, and S. Ross, "Survivorship Bias," *Journal of Finance* (July 1995): 853–873.

U.S. markets]? I can tell you—because many of the others don't have a 100-year history, for a variety of reasons."[6]

Since it is unlikely that the U.S. stock market will replicate its performance over the next century, we adjust downward the historical market risk premium. Dimson, Marsh, and Staunton find that the U.S. arithmetic annual return exceeded a 17-country composite return by 0.8 percent in real terms.[7] If we subtract an 0.8 percent survivorship premium from our range of 5.5 percent to 6.2 percent U.S. excess returns reported in Exhibit 13.2, the difference implies that the U.S. market risk premium, as measured by excess returns, is in the range of 4.7 percent to 5.4 percent, which we round to 5 percent.

With an estimate of the historical market risk premium in hand, it is now possible to estimate the expected market return by adding the market risk premium to the prevailing interest rate. Between 2000 and 2008, the 10-year Treasury bond averaged a 4.5 percent yield to maturity.[8] Adding the 5 percent market risk premium estimated earlier leads to an expected market return (during that period) of approximately 9.5 percent.

The financial crisis of 2007–2009 Adding the historical risk premium to the current Treasury yield worked well until the financial crisis of 2007–2009. To combat the financial crisis, the U.S. Federal Reserve reduced short-term rates to almost zero, pulling down long-term rates as a by-product. It also began a policy of repurchasing bonds in the open market (known as quantitative easing), further pushing up prices and driving down yields. At the same time, U.S. government bonds became a safe haven for investors around the world, leading to high prices and lower yields for government bonds. As the crisis and subsequent recession unfolded, the yield on 10-year government bonds began a long and volatile decline, reaching an all-time low of 1.5 percent in July 2012.[9]

During this period, many practitioners realized that valuation models based on these interest rates didn't lead to sensible results. With government bonds at 1.5 percent, a 5 percent market risk premium implies an expected market return of just 6.5 percent. Compared with pre-crisis expected returns, this should have caused a dramatic rise in market prices. Mathematically, every 1 percent decrease in the cost of equity for the S&P 500 index should increase the price-to-earnings (P/E) ratio of the index by roughly 20 to 25 percent. So a 3 percent drop in cost of equity would have increased the P/E from a typical trading range of 15 times to over 25 times. Yet in 2012, the P/E for the S&P 500 index was well within its normal trading range.

[6]Z. Bodie, "Longer Time Horizon 'Does Not Reduce Risk,"' *Financial Times*, January 26, 2002.

[7]Dimson, Marsh, and Staunton, "The Worldwide Equity Premium."

[8]The "yield to maturity" for U.S. government bonds is a good proxy for the expected return, since default expectations are virtually zero. The same is not true for corporate bonds, as we discuss later in this chapter.

[9] After 2012, the yield on government bonds began a steady increase until dropping back below 2 percent in early 2015.

To overcome the inconsistency between interest rates on government bonds and market values of equities, we recommend using a synthetic risk-free rate. To build a synthetic rate, add the expected inflation rate of 2.5 percent to the long-run average real interest rate of 2 percent, which leads to a synthetic risk-free rate of 4.5 percent.[10] Although it is different from the actual yield, the synthetic yield is based on our judgment that the low interest rates are an aberration caused by the unusual monetary policy and a flight to safety. As the economy returns to historical levels, we believe the government bond rates will rise to historical levels. The result is a cost of equity for the market of about 9.5 percent even during these times of historically low interest rates. If market prices eventually rise to reflect low interest rates (or interest rates rise to reflect market prices), make sure to reevaluate your perspective.

Estimating the risk-free rate in typical times Once Treasury yields better reflect market prices, use the current yield on long-term government bonds to estimate the risk-free rate, and consequently the cost of equity. In choosing the bond's duration, the most theoretically sound approach is to discount each year's cash flow at a cost of equity that matches the maturity of the cash flow. In other words, year 1 cash flows would be discounted at a cost of equity based on a one-year risk-free rate, while year 10 cash flows would be discounted at a cost of equity based on a 10-year discount rate. To do this, use zero-coupon bonds (known as STRIPS)[11] rather than Treasury bonds that make interim payments. The interim payments cause their effective maturity to be much shorter than their stated maturity.

Using multiple discount rates is quite cumbersome. Therefore, few practitioners discount each cash flow using its matched bond maturity. Instead, most choose a single yield to maturity that best matches the cash flow stream being valued. For U.S.-based corporate valuations, use 10-year government STRIPS (longer-dated bonds such as the 30-year Treasury bond might match the cash flow stream better, but they may not be liquid enough to correctly represent the risk-free rate). When valuing European companies, use 10-year German government bonds, because they trade more frequently and have lower credit risk than bonds of other European countries. Always use government bond yields denominated in the same currency as the company's cash flow to estimate the risk-free rate. Also, make sure the inflation rate embedded in your cash flows is

[10] For ease of implementation, we use a single cost of equity to discount all cash flows. More advanced models split cash flows into two periods, an explicit forecast period and a continuing value. When using two periods, discount the first set of cash flows at observed yields, and create the perpetuity using a synthetic risk-free rate. Although a two-period model uses short-term market data more effectively, the valuation differences between one- and two-period models are relatively small, especially for short forecast windows.

[11] Introduced by the U.S. Treasury in 1985, STRIPS stands for "separate trading of registered interest and principal of securities." The STRIPS program enables investors to hold and trade the individual components of Treasury notes and bonds as separate securities.

consistent with the inflation rate embedded in the government bond rate you are using.

Do *not* use a short-term Treasury bill to determine the risk-free rate. When introductory finance textbooks calculate the CAPM, they typically use a short-term Treasury rate because they are estimating expected returns for the next *month.* Use longer-term bonds; they will be better in line with the time horizon of corporate cash flows.

Market implied cost of equity The second approach to estimating the cost of equity for the market is to estimate it based on current share prices and the underlying corporate performance (earnings, ROIC, and growth expectations) of a large sample of companies. Start with the value driver formula described in Chapter 2. In this case, we've expressed it in terms of equity value rather than enterprise value (substituting the cost of equity for the weighted average cost of capital, return on equity for ROIC, etc.):

$$\text{Equity Value} = \frac{\text{Earnings}\left(1 - \dfrac{g}{\text{ROE}}\right)}{k_e - g}$$

where Earnings = equity earnings
g = expected growth in earnings
ROE = expected return on equity
k_e = cost of equity

Solving for the cost of equity gives the following equation:

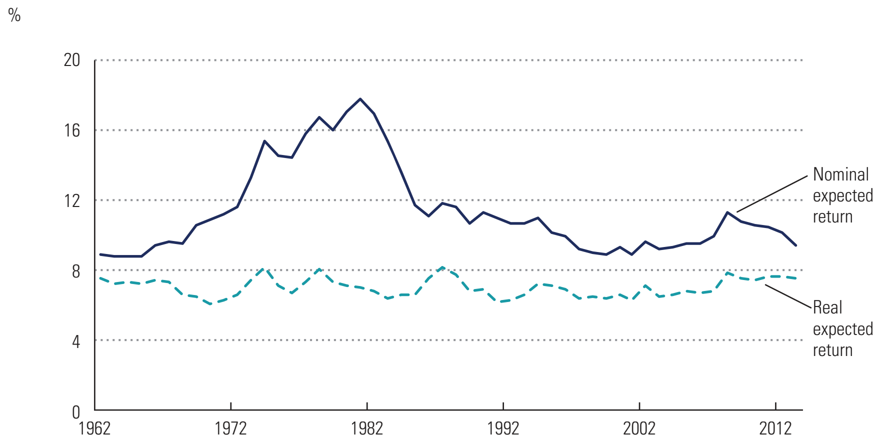
$$k_e = \frac{\text{Earnings}\left(1 - \dfrac{g}{\text{ROE}}\right)}{\text{Equity Value}} + g$$

Earnings divided by the equity value is the inverse of the price-to-earnings (P/E) ratio, so it is possible to further reduce the equation:

$$k_e = \left(\frac{1}{P/E}\right)\left(1 - \frac{g}{\text{ROE}}\right) + g$$

We applied the formula to the S&P 500 index, using the long-run return on equity of 13.5 percent and the long-run growth in real gross domestic product (GDP) of 3.5 percent to convert a given year's S&P 500 median P/E into

EXHIBIT 13.3 **S&P 500 Real and Nominal Expected Returns, 1962–2013**



the cost of equity.[12] Implementing the model was slightly more complex than implied by the formula, because we also stripped out the effects of inflation to arrive at a real cost of equity. Exhibit 13.3 plots the real expected market returns between 1962 and 2013. The results are striking. After inflation is stripped out, the expected market return (*not* excess return) is remarkably constant, averaging 7 percent. For the United Kingdom, the real market return is slightly more volatile and averages 6 percent.

Techniques similar to this date back to Charles Dow in the 1920s, and many authors have tested the concept.[13] Two studies used analyst forecasts to estimate growth,[14] but many argue that analyst forecasts focus on the short term and are severely upward-biased. In a 2001 working paper, Fama and French used long-term dividend growth rates as a proxy for future growth, but they focus on dividend yields, not on available cash flow.[15] Therefore, we believe this implementation is best.

[12] R. Dobbs, T. Koller, and S. Lund, "What Effect Has Quantitative Easing Had on Your Share Price?" *McKinsey on Finance*, no. 49 (Winter 2014): 15–18; and M. H. Goedhart, T. M. Koller, and Z. D. Williams, "The Real Cost of Equity," *McKinsey on Finance*, no. 5 (Autumn 2002): 13–15.
[13] E. Fama and K. French, "Dividend Yields and Expected Stock Returns," *Journal of Financial Economics* 22, no. 1 (1988): 3–25; R. F. Stambaugh, "Predictive Regressions," *Journal of Financial Economics* 54, no. 3 (1999): 375–421; and J. Lewellen, "Predicting Returns with Financial Ratios," *Journal of Financial Economics* 74, no. 2 (2004): 209–235.
[14] J. Claus and J. Thomas, "Equity Premia as Low as Three Percent? Evidence from Analysts' Earnings Forecasts for Domestic and International Stocks," *Journal of Finance* 56, no. 5 (October 2001): 1629–1666; and W. R. Gebhardt, C. M. C. Lee, and B. Swaminathan, "Toward an Implied Cost of Capital," *Journal of Accounting Research* 39, no. 1 (2001): 135–176.
[15] E. F. Fama and K. R. French, "The Equity Premium" (Center for Research in Security Prices Working Paper 522, April 2001).

Once you've estimated the real expected return, add an estimate of inflation that is consistent with your cash flow projections. Use the spread between the yield on inflation-protected bonds and regular government bonds to estimate the expected long-term inflation. In 2013, this spread was approximately 2.5 percent. Adding inflation of 2.5 percent to a real return of 7 percent once again confirms 9.5 percent for the expected market return.

Later in this chapter, we use the price of risk, known as the market risk premium, to adjust the expected market return for industry or company risk. In the preceding section, we estimated the market risk premium at 5 percent. Using the implied cost of equity from the second method leads to similar results. If we subtract the pre-crisis real interest rate of 2 percent from the long-term average market return of 7 percent, this difference leads to a market risk premium equal to 5 percent.

Alternatively, if we use the actual 2013 inflation-adjusted interest rate of 0 percent, this implies a market risk premium of 7 percent. While we are not averse to this larger-than-normal risk premium, our statistical tests do not provide confirming evidence that risk premiums have risen. If this were the case, low-risk stocks should increase in value relative to high-risk stocks, because as the price of risk rises, high-risk stocks require greater returns and consequently have lower valuations. When we examined the trend of P/Es for low-risk stocks versus high-risk stocks, we did not observe any widening of the spread as real interest rates fell.

Closing thoughts on the market risk premium Although many in the finance profession disagree about how to measure the market risk premium, we believe a range around 5 percent is appropriate. Historical estimates found in most textbooks (and locked in the minds of many), which often report numbers near 8 percent, are too high for valuation purposes, because they compare the market risk premium versus Treasury bills (very short-term bonds) and are biased by the historical strength of the U.S. market.

Adjust for Industry/Company Risk

Once you've estimated the cost of equity for the market as a whole, adjust it for differences in risk across companies. Keep in mind the discussion from Chapter 3 about the difference between diversifiable and nondiversifiable risk. Only the nondiversifiable risk that investors cannot eliminate by holding a portfolio of stocks is incorporated into the cost of equity.

The most common model used to adjust the cost of equity for differences in risk is the capital asset pricing model (CAPM). Other models include the Fama-French three-factor model and the arbitrage pricing theory (APT). The three models differ primarily in which factors are used to estimate the effect of compensated risk. Despite recent criticism, we believe that the CAPM remains the best model for estimating the cost of equity. We analyze these three models next, followed by an in-depth discussion of how to apply the CAPM.

Expected-return models The three major models for adjusting for risk differ in the factors used to define risk. The CAPM defines a stock's risk as its sensitivity to the market as a whole.[16] The Fama-French three-factor model defines risk as a stock's sensitivity to three portfolios: the stock market, a portfolio based on firm market capitalization, and a portfolio based on book-to-market ratios. The APT is the most general model. It proposes neither the number of factors nor which factors are appropriate. This lack of guidance has kept the APT mostly in the classroom.

Capital asset pricing model Because the CAPM is discussed at length in modern finance textbooks,[17] we focus only on the key ideas. The CAPM postulates that the expected rate of return on any security equals the risk-free rate plus the security's beta times the market risk premium:

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

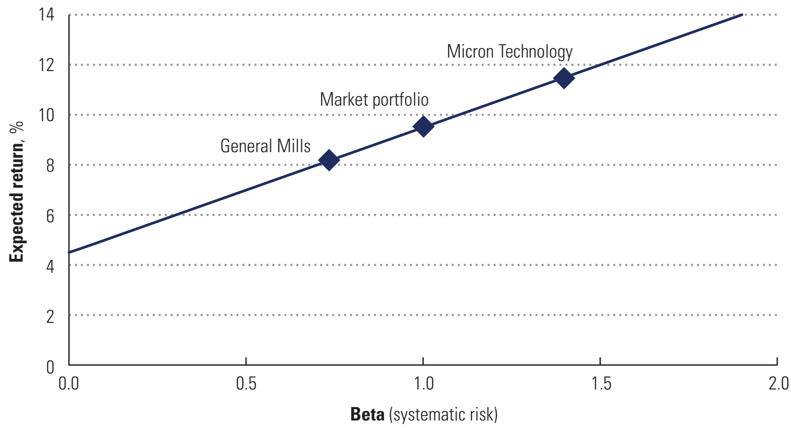
where $E(R_i)$ = expected return of security i
r_f = risk-free rate
β_i = security i's sensitivity to the market
$E(R_m)$ = expected return of the market

In the CAPM, the risk-free rate and the market risk premium, which is defined as the difference between $E(R_m)$ and r_f, are common to all companies; only beta varies across companies. Beta represents a stock's incremental risk to a diversified investor, where risk is defined as the extent to which the stock moves up and down in conjunction with the aggregate stock market.

Consider General Mills, a manufacturer of cereals and snack foods, and Micron Technology, a semiconductor manufacturer that produces memory chips. Basic consumer foods purchases are relatively independent of the stock market's value, so the beta for General Mills is low; we estimated it at 0.73. Based on a risk-free rate of 4.5 percent and a market risk premium of 5 percent, the cost of equity for General Mills equals 8.2 percent (see Exhibit 13.4). In contrast, technology companies tend to have high betas. When the economy struggles, the stock market drops, and companies stop purchasing new

[16]Technically, the CAPM defines the market as the aggregate of all assets, both traded and nontraded. In practice, the market is proxied by a well-diversified equity index such as the Morgan Stanley Capital International (MSCI) World Index or the S&P 500.
[17]For example, R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 11th ed. (New York: McGraw-Hill, 2014); and T. Copeland, F. Weston, and K. Shastri, *Financial Theory and Corporate Policy* (Boston: Pearson Education, 2013).

EXHIBIT 13.4 **Cost of Equity Using the Capital Asset Pricing Model (CAPM)**



technology. Thus, the value of Micron Technology is highly correlated with the market's value, and its beta is high. Based on a beta of 1.40, Micron's expected rate of return equals 11.5 percent. Since General Mills offers greater protection against market downturns than Micron Technology does, investors are willing to pay a premium for the stock, driving down the stock's expected return. Conversely, since Micron offers little diversification in relation to the market portfolio, the company must earn a higher return to entice investors.

In the case of UPS, we used an industry beta of 0.88, which is just less than the beta of the market. The fact that UPS mirrors the market is not surprising. The shipment of goods is highly correlated with economic activity. Using a 4.5 percent risk-free rate and a 5 percent market risk premium, this leads to a cost of equity of 8.9 percent.

Fama-french three-factor model In 1992, Eugene Fama and Kenneth French published a paper in the *Journal of Finance* that received a great deal of attention because they concluded, "In short, our tests do not support the most basic prediction of the SLB [Sharpe-Lintner-Black] Capital Asset Pricing Model that average stock returns are positively related to market betas."[18] Based on prior research and their own comprehensive regressions, Fama and French concluded that equity returns are inversely related to the size of a company (as measured by market capitalization) and positively related to the ratio of a company's book value to its market value of equity.

[18]E. Fama and K. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance* (June 1992): 427–465.

EXHIBIT 13.5 **UPS: Cost of Equity Using Fama-French, 2013**

Factor	Average monthly premium,[1] %	Average annual premium, %	Regression coefficient[2]	Contribution to expected return, %
Market portfolio		5.0	0.80	4.0
Small minus big (SMB) portfolio	0.23	2.8	0.12	0.3
High minus low (HML) portfolio	0.40	4.9	0.46	2.3
Premium over risk-free rate[3]				6.6
			Risk-free rate	4.5
			Cost of equity	11.1

[1] SMB and HML premiums based on average monthly returns data, 1926–2013.
[2] Based on monthly returns data from 2009 to 2013.
[3] Summation rounded to one decimal point.

Given the strength of Fama and French's empirical results, the academic community now measures risk with a model commonly known as the Fama-French three-factor model. With this model, a stock's excess returns are regressed on excess market returns (similar to the CAPM), the excess returns of small stocks over big stocks (commonly referred to as SMB for "small minus big"), and the excess returns of high-book-to-market stocks over low-book-to-market stocks (known as HML for "high minus low").[19] Because the risk premium is determined by a regression on the SMB and HML stock portfolios, a company does not receive a premium for being small. Instead, the company receives a risk premium if its stock returns are correlated with those of small stocks or high-book-to-market companies. The SMB and HML portfolios are meant to replicate unobservable risk factors, factors that cause small companies with high book-to-market values to outperform their CAPM expected returns.

We use the Fama-French three-factor model to estimate UPS's cost of equity in Exhibit 13.5. To determine the company's three betas, regress UPS monthly stock returns against the excess market portfolio, SMB, and HML.[20] As the exhibit indicates, the UPS beta on the market portfolio is slightly lower in the Fama-French regression than when using the CAPM, but its cost of equity is higher because UPS is positively correlated with small companies (remember, small companies outperform big companies on average) and companies with a high book-to-market ratio (high-book-to-market companies outperform low-book-to-market companies on average). Based on the historical annualized premiums for SMB (2.8 percent) and HML (5.0 percent), UPS's cost of equity equals 11.1 percent, versus 8.9 percent from the CAPM using beta.

Given that UPS is a large company with a strong ROIC, it is surprising that UPS is positively correlated with the small-stock portfolio and companies with

[19] For a complete description of the factor returns, see E. Fama and K. French, "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33 (1993): 3–56.
[20] Given the model's popularity, Fama-French portfolio returns are now available from professional data providers.

high book-to-market ratios. Is a large, stable company such as UPS really more risky than the average stock? Unfortunately, the Fama-French model does not provide much guidance on the reasons behind the regression results. Whereas the CAPM is based on solid theory about risk and return (albeit with strong assumptions), the Fama-French model is based purely on empirical evidence. Although the latter model has been loosely tied to risk factors such as illiquidity (size premium) and default risk (book-to-market premium), no theory has gained universal acceptance.

In addition, it is important to use caution when relying on regression results for one company at a particular point in time. As we will explain later in this chapter, regression results are imprecise. To best implement the CAPM, for instance, we recommend using a peer group beta, rather than raw regression results. In the Fama-French model, three beta coefficients exist, and their estimation depends on one another. A set of industry betas cannot be created cleanly. Consequently, the Fama-French model works well for controlling the risk of large historical data sets but may not be appropriate for measuring a single company's cost of equity.

The bottom line? It takes a better theory to kill an existing theory, and we have yet to see the better theory. Therefore, we continue to use the CAPM while keeping a watchful eye on new research in the area.

Arbitrage pricing theory Another alternative to the CAPM, the arbitrage pricing theory (APT), resembles a generalized version of the Fama-French three-factor model. In the APT, a security's actual returns are generated by k factors and random noise:

$$R_i = \alpha + \beta_1 F_1 + \beta_2 F_2 + \ldots + \beta_k F_k + \varepsilon$$

where F_k = return on factor k.

Since investors can hold well-diversified factor portfolios, epsilon risk will disappear. In this case, a security's expected return must equal the risk-free rate plus the cumulative sum of its exposure to each factor times the factor's risk premium (λ):[21]

$$E(R_i) = r_f + \beta_1 \lambda + \beta_2 \lambda + \ldots + \beta_k \lambda_k$$

Otherwise, arbitrage (positive return with zero risk) is possible.

On paper, the theory is extremely powerful. Any deviations from the model result in unlimited returns with no risk. In practice, implementation of the model has been tricky, as there is little agreement about how many factors there

[21]For a thorough discussion of the arbitrage pricing theory, see M. Grinblatt and S. Titman, *Financial Markets and Corporate Strategy*, 2nd ed. (New York: McGraw-Hill, 2001).

are, what the factors represent, or how to measure the factors. For this reason, use of the APT resides primarily in the classroom.

Applying the CAPM To apply the CAPM in practice, you must estimate each component. The core question for a company's cost of equity is how to estimate a company's risk relative to the market, and consequently beta. Keep in mind that when you are valuing a company, your objective is not to precisely measure the company's historical beta. Rather, it is to estimate its future beta. Therefore, you must use judgment and common sense, not a purely mechanical approach.

We find that individual company betas can at any point in time be heavily influenced by nonrepeatable events, so we recommend using an industry peer median rather than the historically measured beta for the company in question. Betas can also be affected by unusual events in the stock market, such as the dot-com bubble. By examining how industry betas have changed over time, you can apply judgment about whether betas will revert to their long-term level if they are currently not there.

The remainder of this section describes how to estimate a company's beta step-by-step. First estimate a beta for each company in the peer group. Then convert each beta into an unlevered beta. Once you have a collection of betas, examine the sample for a representative beta, such as the median beta. To ensure that the current beta is representative of risk and not an artifact of unusual data, do not rely on a point estimate. Instead, examine the trend over time.

Estimating beta for each company in the industry sample set To develop an industry beta, you first need the betas of the company's peer set. Since beta cannot be observed directly, you must *estimate* its value. The most common regression used to estimate a company's raw beta is the market model:

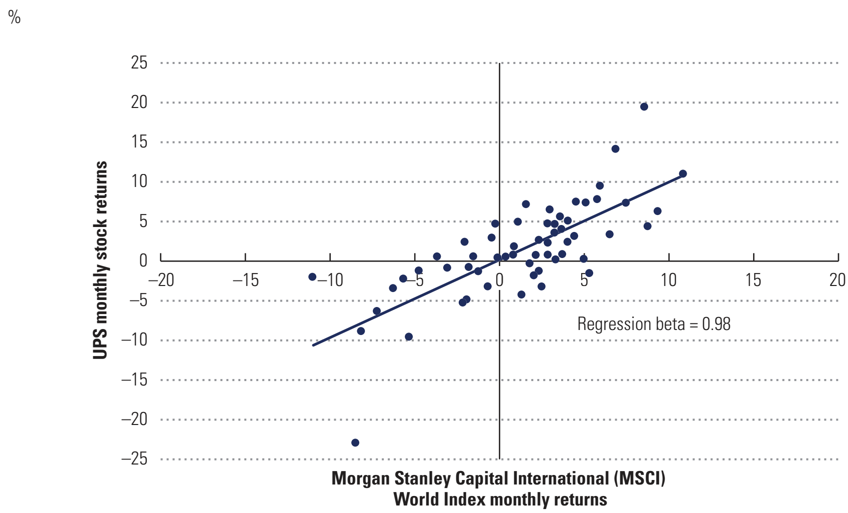
$$R_i = \alpha + \beta R_m + \varepsilon$$

In the market model, the stock's return (R_i), not price, is regressed against the market's return.

Exhibit 13.6 plots 60 months of UPS stock returns versus Morgan Stanley Capital International (MSCI) World Index returns between 2009 and 2013. The solid line represents the "best fit" relationship between UPS's stock returns and the stock market. The slope of this line is commonly denoted as beta. For UPS, the company's raw regression beta (slope) is 0.98.

But why did we choose to measure UPS returns in months? Why did we use five years of data? And how precise is this measurement? The CAPM is a one-period model and provides little guidance on how to use it for valuation. Yet following certain market characteristics and the results of a variety of empirical tests leads to several guiding conclusions:

EXHIBIT 13.6 **UPS: Stock Returns, 2009–2013**



Source: Bloomberg.

- The measurement period for raw regressions should include at least 60 data points (e.g., five years of monthly returns). Rolling betas should be graphed to search for any patterns or systematic changes in a stock's risk.
- Raw regressions should be based on monthly returns. Using more frequent return periods, such as daily and weekly returns, leads to systematic biases.[22]
- Company stock returns should be regressed against a value-weighted, well-diversified market portfolio, such as the MSCI World Index, bearing in mind that this portfolio's value may be distorted if measured during a market bubble.

In the CAPM, the market portfolio equals the portfolio of all assets, both traded (such as stocks and bonds) and untraded (such as private companies and human capital). Since the true market portfolio is unobservable, a proxy is necessary. For U.S. stocks, the most common proxy is the S&P 500, a value-weighted index of large U.S. companies. Outside the United States, financial analysts rely on either a regional index like the MSCI Europe Index or the MSCI World Index, a value-weighted index comprising large stocks from 23 developed countries (including the United States).

[22]Using daily or even weekly returns is especially problematic when the stock is rarely traded. An illiquid stock will have many reported returns equal to zero, not because the stock's value is constant but because it hasn't traded (only the last trade is recorded). Consequently, estimates of beta on illiquid stocks are biased downward. Using longer-dated returns, such as monthly returns, lessens this effect.

Most well-diversified indexes, such as the S&P 500 and MSCI World Index, are highly correlated (the two indexes had a 95.8 percent correlation between 2000 and 2009). Thus, the choice of index will have only a small effect on beta. Do *not*, however, use a local market index (which some data services provide). Most countries are heavily weighted in only a few industries and, in some cases, a few companies. Consequently, when measuring beta versus a local index, you are not measuring market-wide systematic risk, but rather a company's sensitivity to a particular industry.

Beta smoothing Many academics and beta services also adjust a company's raw beta closer to the mean of all companies (called smoothing). Smoothing moves the point estimate of beta toward the overall average. Consider the simple smoothing process used by Bloomberg:

$$\text{Adjusted Beta} = 0.33 + 0.67(\text{Raw Beta})$$

This formula smooths raw regression estimates toward 1. For instance, a raw beta of 0.5 leads to an adjusted beta of 0.67, while a raw beta of 1.5 leads to an adjusted beta of 1.34.

Bloomberg's smoothing mechanism dates back to Marshall Blume's observation that betas revert to the mean.[23] Today, more advanced smoothing techniques exist.[24] Although the proof is beyond the scope of this book, the following adjustment will reduce beta estimation error:

$$\beta_{\text{adj}} = \left(\frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_b^2}\right)1 + \left(1 - \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_b^2}\right)\beta_{\text{raw}}$$

where σ_ε = standard error of the regression beta
σ_b = cross-sectional standard deviation of all betas

The raw regression beta receives the most weight when the standard error of beta from the regression (σ_ε) is smallest. In fact, when beta is measured perfectly ($\sigma_\varepsilon = 0$), the raw beta receives all the weight. Conversely, if the regression provides no meaningful results (σ_ε is very large), you should set beta equal to 1.0.

In the case of UPS, we did not smooth the beta, since the relevered industry beta was already close to 1.0.

[23]M. Blume, "Betas and Their Regression Tendencies," *Journal of Finance* 30 (1975): 1–10.
[24]For instance, see P. Jorion, "Bayes-Stein Estimation for Portfolio Analysis," *Journal of Financial and Quantitative Analysis* 21 (1986): 279–292.

Creating an industry beta Estimating beta is an imprecise process. We used historical regression to estimate UPS's raw beta at 0.98. But the regression's R-squared was only 55 percent, and the standard error of the beta estimate was 0.12. Using two standard errors as a guide, we feel confident UPS's true beta lies between 0.74 and 1.22—hardly a tight range.

To improve the precision of beta estimates, use industry, rather than company-specific, betas. Companies in the same industry face similar *operating* risks, so they should have similar operating betas. As long as estimation errors across companies are uncorrelated, overestimates and underestimates of individual betas will tend to cancel, and an industry median (or average) beta will produce a superior estimate.[25]

Consider two companies in the same industry competing for a large customer contract. Depending on which company wins the contract, one company's stock price will rise; the other company's stock price will fall. If the market rises during this period, the winning company will have a higher measured beta, and the losing company will have a lower measured beta, even though the decision had nothing to do with market performance. Using an industry beta to proxy for company risk lessens the effect of idiosyncratic shocks.

Simply using the median of an industry's raw regression betas, however, overlooks an important factor: leverage. A company's beta is a function of not only its operating risk, but also the financial risk it takes. Shareholders of a company with more debt face greater risks, and this increase is reflected in beta. Therefore, to compare companies with similar operating risks, you must first strip out the effect of leverage. Only then can you compare betas across an industry.

To undo the effect of leverage (and its tax shield), we rely on the theories of Franco Modigliani and Merton Miller, introduced in Chapter 8. According to Modigliani and Miller, the weighted average risk of a company's financial claims equals the weighted average risk of a company's economic assets. Using beta to represent risk, this relationship is as follows:

$$\underbrace{\frac{V_u}{V_u + V_{txa}}\beta_u}_{\substack{\text{Operating}\\\text{Assets}}} + \underbrace{\frac{V_{txa}}{V_u + V_{txa}}\beta_{txa}}_{\substack{\text{Tax}\\\text{Assets}}} = \underbrace{\frac{D}{D+E}\beta_d}_{\text{Debt}} + \underbrace{\frac{E}{D+E}\beta_e}_{\text{Equity}}$$

where V_u = value of the company's operating assets
V_{txa} = value of the company's interest tax shields
D = market value of the company's debt
E = market value of the company's equity

[25] Statistically speaking, the sample average will have the lowest mean squared error. However, because sample averages are heavily influenced by outliers, we prefer the median beta.

β_u = beta of the unlevered operating assets
β_d = beta of debt
β_e = beta of equity
β_{txa} = beta of tax shields

Appendix C rearranges the equation to solve for the beta of equity (β_e). This leads to:

$$\beta_e = \beta_u + \frac{D}{E}(\beta_u - \beta_d) - \frac{V_{txa}}{E}(\beta_u - \beta_{txa})$$

To simplify the formula further, if the company maintains a ratio of debt to equity, the value of tax shields will fluctuate with the value of operating assets, and the beta of the tax shields (β_{txa}) will equal the beta of the unlevered company (β_u). Setting β_{txa} equal to β_u eliminates the final term:[26]

$$\beta_e = \beta_u + \frac{D}{E}(\beta_u - \beta_d)$$

Some people further simplify by assuming that the beta of debt is zero. Others use a beta of 0.3 for the debt of investment-grade companies, which is approximately the implied beta based on the spread between investment-grade corporate debt and government debt.

Thus, a company's equity beta equals the company's operating beta (also known as the unlevered beta) times a leverage factor. As leverage rises, so will the company's equity beta. Using this relationship, we can convert equity betas into unlevered betas. Since unlevered betas focus solely on operating risk, they can be averaged across an industry (assuming industry competitors have similar operating characteristics).

To calculate an industry beta, follow these steps. First, calculate the beta for each company in your peer set and unlever each beta at each company's debt-to-equity ratio. Remove any outliers, that is, companies where the beta is unusually far away from those of the other companies; these are typically driven by anomalous events and are unlikely to recur. Calculate a median beta and an average beta of the sample set. Statistically speaking, the sample average will have the smallest estimation error. However, because small-sample averages are heavily influenced by outliers, we prefer the median beta. The final step is to plot the median industry beta over a long period. Look to see if the beta is changing in a predictable way and whether the current beta is the best predictor of future beta for the industry.

Examining the long-term trend Exhibit 13.7 presents the median unlevered beta for global retailers between 1999 and 2014. Our sample includes well-known companies such as Carrefour, Costco, MetroAG, and Wal-Mart. Over

[26]See Appendix C for a comprehensive set of equations with different assumptions for the proportion of debt to equity, the beta of debt, and the beta of the tax shields.

EXHIBIT 13.7 **Global Retail: Unlevered Beta of Peer Set**

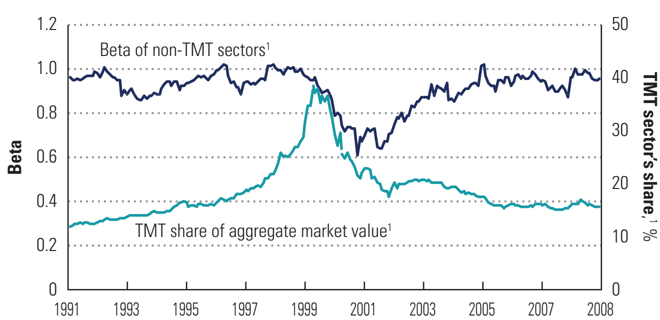
3-year rolling median

Source: Bloomberg.

the past 15 years, the beta for retail has been quite volatile but has always centered on a long-run mean of 0.7. Unless there is a discernible trend or dramatic change in the industry, we believe the long-run unlevered beta provides a better estimate of future beta than a single point estimate. Therefore, use the long-run mean when relevering the industry beta to the company's target capital structure.

In some cases, examining the long-term trend will reveal important insight about beta and market prices. In the late 1990s, equity markets rose dramatically, but this increase was confined primarily to extremely large-capitalization stocks and stocks in the telecommunications, media, and technology sectors (commonly known as TMT). Historically, TMT stocks contribute approximately 15 percent of the market value of the S&P 500. Between 1998 and 2000, this percentage rose to 40 percent. And as the market portfolio changed, so too did industry betas. Exhibit 13.8 presents the median beta over time for

EXHIBIT 13.8 **Effect of the Dot-Com Bubble on Beta**



[1]TMT = telecommunications, media, and technology.

EXHIBIT 13.9 **Unlevered Beta Estimates by Industry**

Industry	Beta range
Electric utilities	0.5–0.7
Health-care providers	0.7–0.8
Integrated oil and gas	0.7–0.8
Airlines	0.7–0.9
Consumer packaged goods	0.8–0.9
Pharmaceutical	0.8–1.0
Retail	0.8–1.0
Telecom	0.8–1.0
Mining	0.9–1.0
Automotive and assemblers	0.9–1.1
Chemicals	0.9–1.1
IT services, hardware	0.9–1.1
Software	0.9–1.1
Banking	1.0–1.1
Insurance	1.0–1.1
Semiconductors	1.0–1.3

stocks outside TMT, such as food companies, airlines, and pharmaceuticals.[27] The median beta dropped from 1.0 to 0.6 as TMT became a dominant part of the overall market portfolio.

With the collapse of the TMT sector in 2001, TMT stocks returned to their original proportion of the overall market. Since beta is computed using historical data, however, non-TMT betas still reflected the TMT-heavy market composition. Thus, to value future cash flows after 2001, a more appropriate beta than the 2001 beta would be the one from 1997, when the market composition last matched the post-2001 composition. Remember, the end goal is not to measure beta historically, but rather to use the historical estimate as a predictor of future value. In this case, recent history wasn't very useful, so it is important not to overweight it.

To determine the beta for UPS, we use data from UPS and FedEx. We start by estimating the beta for both companies using regression analysis (as shown in Exhibit 13.6), and then unlever the results using each company's respective debt-to-equity ratio. Given the companies' operating similarities, the two betas track each other closely. To determine the cost of equity, we relever the average beta using UPS's current debt-to-equity ratio. This leads to a beta of 0.88 and a cost of equity of 8.9 percent.

Exhibit 13.9 presents estimates of levered betas for a selection of industries. We present a range for each industry because even industry betas will fluctuate over time.

[27] A. Annema and M. Goedhart, "Better Betas," *McKinsey on Finance*, no. 6 (Winter 2003): 10–13; and A. Annema and M. Goedhart, "Betas: Back to Normal," *McKinsey on Finance*, no. 20 (Summer 2006): 14–16.

ESTIMATING THE AFTER-TAX COST OF DEBT

The weighted average cost of capital blends the cost of equity with the after-tax cost of debt. To estimate the cost of debt for investment-grade companies, use the yield to maturity of the company's long-term, option-free bonds. Multiply your estimate of the cost of debt by 1 minus the marginal tax rate to determine the cost of debt on an after-tax basis.

Technically speaking, yield to maturity is only a proxy for expected return, because the yield is a *promised* rate of return on a company's debt (it assumes all coupon payments are made on time and the debt is paid in full). An enterprise valuation based on the yield to maturity is therefore theoretically inconsistent, as expected free cash flows should be discounted by an expected return, not a promised yield. For companies with investment-grade debt, the probability of default is so low that this inconsistency is immaterial, especially when compared with the estimation error surrounding the cost of equity. Thus, for estimating the cost of debt for a company with investment-grade debt (debt rated at BBB or better), yield to maturity is a suitable proxy. For companies with below-investment-grade debt, we recommend using adjusted present value (APV) discounted at the unlevered cost of equity, rather than the WACC, to value the company.

Bond Ratings and Yield to Maturity

To solve for yield to maturity (YTM), reverse engineer the discount rate required to set the present value of the bond's promised cash flows equal to its price:

$$\text{Price} = \frac{\text{Coupon}}{(1+\text{YTM})} + \frac{\text{Coupon}}{(1+\text{YTM})^2} + \ldots + \frac{\text{Face} + \text{Coupon}}{(1+\text{YTM})^N}$$

Ideally, yield to maturity should be calculated on liquid, option-free, long-term debt. As discussed earlier in this chapter, short-term bonds do not match the duration of the company's free cash flow. If the bond is rarely traded, the bond price will be outdated (often referred to as stale). Using stale prices will lead to an outdated yield to maturity. Yield to maturity can also be distorted when corporate bonds have attached options, such as callability or convertibility at a fixed price, as their value will affect the bond's price but not its promised cash flows.

In the United States, you can download the yield to maturity for corporate debt free of charge by using the TRACE pricing database.[28] Exhibit 13.10

[28]The Financial Industry Regulatory Authority (FINRA) introduced TRACE (Trade Reporting and Compliance Engine) in July 2002. The system captures and disseminates transactions in investment-grade, high-yield, and convertible corporate debt, representing all over-the-counter market activity in these bonds.

EXHIBIT 13.10 **UPS: Trading Data on Corporate Debt, December 2013**

Bond: 4.875% due November 2040

Trade	**Trade date**	**Trade time**	**Trade volume,** $ thousand	**Bond price**, $	**Yield**, %
1	12/27/13	9:14:07	7	102.08	4.74
2	12/27/13	9:13:44	7	102.08	4.74
3	12/27/13	9:05:22	7	101.00	4.81
4	12/27/13	9:05:22	7	101.00	4.81
5	12/10/13	16:10:31	1,000	104.46	4.58 ←
6	12/6/13	13:00:35	300	103.25	4.66
				UPS bond yield	4.58
				30-year U.S. Treasury yield	(3.83)
				UPS default premium	0.75

Source: The Financial Industry Regulatory Authority's Trade Reporting and Compliance Engine (TRACE).

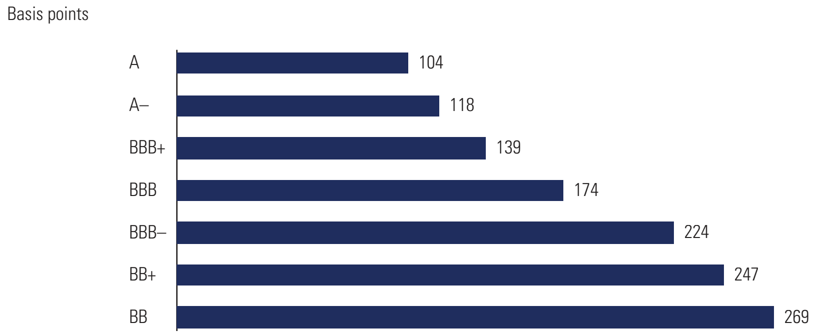
displays TRACE data for UPS's 4.875 percent bonds due in November 2040. TRACE reports four data items: when the trade occurred, the size of the trade, the bond price, and the implied yield to maturity. As the exhibit shows, the 2040 bond trades infrequently—only six times during the entire month. UPS's short-maturity debt trades more frequently, but at only five years to maturity its duration is a poor match for the company's long-term cash flows. When measuring the yield to maturity, use trades greater than $1 million, as smaller trades are unreliable. The largest trade for UPS's 2040 bond was consummated at 4.58 percent (0.75 percent above the yield for a 30-year U.S. Treasury bond).

For companies with only short-term bonds or bonds that rarely trade, do not use market prices. Instead, use credit ratings to determine yield to maturity. First, determine the company's credit rating on unsecured long-term debt. Next, examine the average yield to maturity on a portfolio of long-term bonds with the same credit rating. Use this yield as a proxy for the company's implied yield on long-term debt.

To determine a company's bond rating, a rating agency like S&P or Moody's will examine the company's most recent financial ratios, analyze the company's competitive environment, and interview senior management. Corporate bond ratings are freely available to the public and can be downloaded from rating-agency websites. For example, consider UPS. On September 21, 2012, S&P downgraded UPS's long-term debt from AA– to A+. Moody's quickly followed, downgrading UPS to Aa3 on September 24, 2012. The two agencies' ratings are one notch different, but large splits in ratings occur relatively infrequently (if they do, use the most recent rating).

Once you have a rating, convert the rating into a yield to maturity. Exhibit 13.11 presents U.S. corporate yield spreads over U.S. government bonds. All

EXHIBIT 13.11 **Yield Spread over U.S. Treasuries by Bond Rating, December 2013**



Source: Bloomberg bond portfolio with 10-year maturity.

quotes are presented in basis points, where 100 basis points equals 1 percent. Since UPS is rated A+ by S&P and Aa3 by Moody's, we estimate that the yield to maturity should trade less than 104 basis points over the U.S. Treasury bond. (Bloomberg no longer reports AA industrial yields, so an exact yield is no longer available.)

Using the company's bond ratings to determine the yield to maturity is a good alternative to calculating the yield to maturity directly. Never, however, approximate the yield to maturity using a bond's coupon rate. Coupon rates are set by the company at time of issuance and approximate the yield only if the bond trades near its par value. When valuing a company, you must estimate expected returns relative to *today's* comparable investments. Thus, when you measure the cost of debt, estimate what a comparable investment would earn if bought or sold today.

Below-Investment-Grade Debt

In practice, few financial analysts distinguish between expected and promised returns. But for debt below investment grade, using the yield to maturity as a proxy for the cost of debt can cause significant error.

To understand the difference between expected returns and yield to maturity, consider the following example. You have been asked to value a one-year zero-coupon bond whose face value is $100. The bond is risky; there is a 25 percent chance the bond will default and you will recover only half the final payment. Finally, the cost of debt (not yield to maturity), estimated using the CAPM, equals 6 percent.[29]

[29]The CAPM applies to any security, not just equities. In practice, the cost of debt is rarely estimated using the CAPM, because infrequent trading makes estimation of beta impossible.

Based on this information, you estimate the bond's price by discounting *expected* cash flows by the cost of debt:

$$\text{Price} = \frac{E(\text{Cash Flows})}{1 + k_d} = \frac{(.75)(\$100) + (.25)(\$50)}{1.06} = \$82.55$$

Next, to determine the bond's yield to maturity, place promised cash flows, rather than expected cash flows, into the numerator. Then solve for the yield to maturity:

$$\text{Price} = \frac{\text{Promised Cash Flows}}{1 + \text{YTM}} = \frac{\$100}{1 + \text{YTM}} = \$82.55$$

Solving for YTM, the \$82.55 price leads to a 21.1 percent yield to maturity. This yield to maturity of 21.1 percent is *much* higher than the cost of debt of 6 percent.

So what drives the yield to maturity? Three factors: the cost of debt, the probability of default, and the recovery rate after default. When the probability of default is high and the recovery rate is low, the yield to maturity will deviate significantly from the cost of debt. Thus, for companies with high default risk and low ratings, the yield to maturity is a poor proxy for the cost of debt.

When a company is not investment-grade, rated BB or below, we do not recommend using the weighted average cost of capital to value the company. Instead, use adjusted present value. The APV model discounts projected free cash flow at the company's industry-based unlevered cost of equity, and adds the present value of tax shields. For more on APV valuation, see Chapter 8.

If you must use the WACC approach, you should use the expected return on the non-investment-grade debt, not the promised return. We suggest using the CAPM. Non-investment-grade bonds typically have a beta 0.1 higher than investment-grade debt. Assuming a 5 percent market risk premium, this translates to a premium of 0.5 percent over investment-grade bonds. Thus, to estimate the cost of non-investment-grade debt (the expected return), use the BBB yield to maturity plus 0.5 percent.

Incorporating the Interest Tax Shield

To calculate free cash flow (using techniques detailed in Chapters 8 and 9), we compute taxes as if the company were entirely financed by equity. By using all-equity taxes, it is possible to make comparisons across companies and over time, without regard to capital structure. Yet since the tax shield has value, it must be accounted for. In an enterprise DCF using the WACC, the tax shield is valued as part of the cost of capital. To value the tax shield, reduce the cost of debt by the marginal tax rate:

$$\text{After-Tax Cost of Debt} = \text{Cost of Debt} \times (1 - T_m)$$

Chapters 8 and 9 detail how to calculate the marginal tax rate for historical analysis. For use in the cost of capital, calculate the marginal tax rate in a consistent manner, with one potential modification. Multinational companies often borrow money in high-tax countries to lower their tax burden in that country. Check the annual report for the location of corporate debt, and, if necessary, use the marginal tax rate where the debt was raised and not the marginal tax rate of the company's home country.

For companies with either low or volatile earnings, the statutory tax rate may overstate the marginal tax rate in future years. According to research by John Graham, the statutory marginal tax rate overstates the *future* marginal tax rate because of rules related to tax loss carryforwards, tax loss carrybacks, investment tax credits, and alternative minimum taxes.[30] Graham uses simulation to estimate the realizable marginal tax rate on a company-by-company basis. For investment-grade companies, use the statutory rate. Graham estimates that the marginal tax rate is on average five percentage points below the statutory rate primarily driven by smaller, less profitable companies.

USING TARGET WEIGHTS TO DETERMINE THE COST OF CAPITAL

With our estimates of the cost of equity and after-tax cost of debt, it is now possible to blend the two expected returns to estimate the WACC. To do this, use the target weights of debt (net of excess cash) and equity to enterprise value (net of excess cash), on a market basis:

$$\text{WACC} = \frac{D}{V}k_d(1 - T_m) + \frac{E}{V}k_e$$

Using market values rather than book values to weight expected returns follows directly from the formula's algebraic derivation (see Appendix B for a derivation of free cash flow and WACC). But consider a more intuitive explanation: the WACC represents the expected return on a *different* investment with identical risk. Rather than reinvest in the company, management could return capital to investors, who could reinvest elsewhere. To return capital without changing the capital structure, management can repay debt and repurchase

[30] J. Graham and L. Mills, "Using Tax Return Data to Simulate Corporate Marginal Tax Rates," *Journal of Accounting and Economics* 46 (2009): 366–388; and J. Graham, "Proxies for the Corporate Marginal Tax Rate," *Journal of Financial Economics* 42 (1996): 187–221.

shares, but must do so at their *market* value. Conversely, book value represents a sunk cost, so it is no longer relevant.

The cost of capital should rely on target weights, rather than current weights, because at any point, a company's current capital structure may not reflect the level expected to prevail over the life of the business. The current capital structure may merely reflect a short-term swing in the company's stock price, a swing that has yet to be rebalanced by management. Thus, using today's capital structure may cause you to overestimate (or underestimate) the value of tax shields for companies whose leverage is expected to drop (or rise).

Many companies are already near their target capital structure. If the company you are valuing is not, decide how quickly the company will achieve the target. In the simplest scenario, the company will rebalance immediately and maintain the new capital structure. In this case, using the target weights and a constant WACC (for all future years) will lead to a reasonable valuation. If you expect the rebalancing to happen over a long period of time, then use a different cost of capital each year, reflecting the capital structure at the time. In practice, this procedure is complex; you must correctly model the weights, as well as the changes in the cost of debt and equity (because of increased default risk and higher betas). For extreme changes in capital structure, modeling enterprise DCF using a constant WACC can lead to significant error. In this case, do not use WACC. Instead, value the company using adjusted present value.

To estimate the target capital structure from an external perspective, first estimate the company's current market-value-based capital structure. Next, review the capital structure of comparable companies. Finally, examine management's implicit or explicit approach to financing and its implications for the target capital structure. We discuss each step next.

Current Capital Structure

To determine the company's current capital structure, measure the market value of all claims against enterprise value. For most companies, the claims will consist primarily of traditional debt and equity (this chapter's final section addresses more complex securities). If a company's debt and equity are publicly traded, simply multiply the quantity of each security by its most recent price. Most difficulties arise when securities are not traded and prices cannot be readily observed.

Debt and debt equivalents, net of excess cash To value debt and debt equivalents, sum short-term debt, long-term debt, and debt equivalents like unfunded retirement obligations. From this total, subtract excess cash to determine net debt. Debt will be recorded on the balance sheet at book value, which may differ from market value. Therefore, use a data service to determine market value when possible. In the case of debt equivalents, the valuation method will depend on the account. We discuss the valuation of debt and debt equivalents next.

Market prices for U.S. corporate debt are reported on the Financial Industry Regulatory Authority (FINRA) TRACE system. For UPS, Exhibit 13.10 shows that a 2040 bond traded at $104.46, or 104.46 percent of par value at 16:10 on December 10, 2013. Although more recent trades exist, we use the trade on December 10 because later trades are too small to be reliable. To determine the market value of the bond, multiply 104.46 percent by the bond's book value of $500 million (found in the UPS annual report), which equals $522.30 million. Since a bond's price depends on its coupon rate versus its yield, not every UPS bond trades at the same price. For instance, a UPS bond maturing in 2038 recently closed at 121.96 percent of par over the same time period. Consequently, value each debt separately.

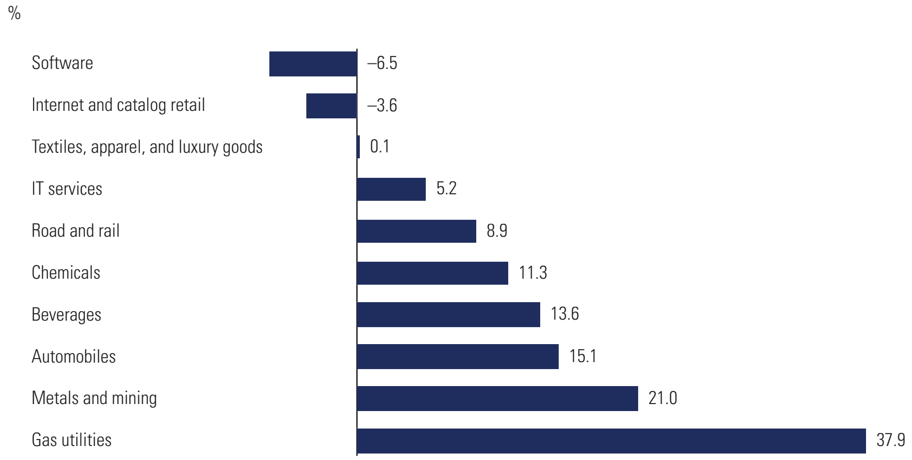
If an observable market value is not readily available, value debt securities at book value (referred to as carrying value), or use discounted cash flow. In most cases, the book value reported on the balance sheet reasonably approximates the current market value. This will not be the case, however, if interest rates have changed since the company's last valuation or if the company has entered into financial distress. In these two situations, the current price will differ from carrying value because either expected cash flows have changed or the discount rate has changed from its last valuation.[31] In these situations, value each bond separately by discounting promised cash flows at the appropriate yield to maturity. The size and timing of coupons will be disclosed in the notes of a company's annual report. Determine the appropriate yield to maturity by examining the yields from comparably rated debt with similar maturities.

Next, value debt equivalents, such as operating leases and unfunded retirement obligations. Include operating leases in debt only if you plan to adjust free cash flow for operating leases as well (see Chapter 20 for the specifics on how to adjust free cash flow). Consistency between free cash flow and the cost of capital is paramount. Use the formula presented in Chapter 20 to estimate the value of leases. To find the value of unfunded retirement obligations, search the pension note for the most recent market value. Although accounting authorities require disclosure of unfunded retirement obligations on the balance sheet, it is often embedded in other accounts.

Equity If the company's common stock is publicly traded, multiply the market price by the number of shares *outstanding*. The market value of equity

[31] For floating-rate bonds, changes in Treasury rates won't affect value, since coupons float with Treasury yields. Changes in market-based default premiums, however, will affect the market value of floating-rate bonds, since bonds are priced at a fixed spread above Treasury yields.

EXHIBIT 13.12 **Median Debt to Value by Industry, 2013**[1]



[1] S&P 1500 classified by GICS industry. Market values used when available.

should be based on shares outstanding in the capital market. Do not use shares issued, as they may include shares repurchased by the company but not retired. For European companies in particular, you need to be careful in determining the correct amount of shares outstanding because of the way companies sometimes account for treasury shares.

At this point, you may be wondering why you are valuing the company if you are going to rely on the market's value of equity in the cost of capital. Shouldn't you be using the estimated equity value? No. Remember, you are only estimating today's market value to frame management's philosophy concerning capital structure. To value the company, use forward-looking *target* weights.

For privately held companies, no market-based values are available. In this case, you must determine equity value (for the cost of capital) either using a multiples approach or through DCF iteratively. To perform an iterative valuation, assume a reasonable capital structure, and value the enterprise using DCF. Using the estimate of debt-to-enterprise value, repeat the valuation. Continue this process until the valuation no longer materially changes.

Capital Structure of Peer Companies

To place the company's current capital structure in the proper context, compare its capital structure with those of similar companies. Exhibit 13.12 presents the median debt-to-value levels for 10 industries. As the exhibit shows, high-growth industries like software and IT services, especially those with intangible investments, tend to use very little debt. In fact, many companies hold more excess cash than debt, causing the net debt ratio to be negative.[32] Industries with heavy fixed investment in tangible assets, like mining and utilities, tend to have higher debt levels. Economy-wide, the median debt-to-value ratio for S&P 1500 nonfinancials is 8 percent, and the median debt-to-equity ratio is 9 percent.

It is perfectly acceptable for a company's capital structure to be different from that of its industry. But you should understand why. For instance, is the company philosophically more aggressive or innovative in the use of debt financing, or is the capital structure only a temporary deviation from a more conservative target? Often, companies finance acquisitions with debt they plan to retire quickly or refinance with a stock offering. Alternatively, is there anything different about the company's cash flow or asset intensity that can explain the difference? Determine the cause for any difference before applying a target capital structure.

Management's Financing Philosophy

As a final step, review management's historical financing philosophy; even better, question management outright, if possible. Has the current team been actively managing the company's capital structure? Is the management team aggressive in its use of debt? Or is it overly conservative? Consider Nike, the athletic-shoe company. Although cash flow is strong and stable, the company rarely issues debt. From a financing perspective, it doesn't need to issue additional securities; investments can be funded with current profits.

COMPLEX CAPITAL STRUCTURES

The weighted average cost of capital is determined by weighting each security's expected return by its proportional contribution to total value. For a complex security, such as convertible debt, measuring expected return is challenging. Is a convertible bond like straight debt, enabling us to use the yield to maturity? Is it like equity, enabling us to use the CAPM? In actuality, it is neither, so we recommend an alternative method.

If the treatment of hybrid securities will make a material difference in valuation results,[33] we recommend using adjusted present value (APV). In the APV model, enterprise value is determined by discounting free cash flow at the industry-based unlevered cost of equity. The value of incremental cash

[32]Over the past 15 years, cash balances have grown substantially. Cash balances have grown because companies must pay taxes in their home country on any repatriated earnings. For companies whose home country's tax rate is relatively high, cash will become trapped abroad.

[33]If the hybrid security is out-of-the-money and unlikely to be converted, it can be treated as traditional debt. Conversely, if the hybrid security is well in-the-money, it should be treated as traditional equity. In these situations, errors are likely to be small, and a WACC-based valuation remains appropriate.

flows related to financing, such as interest tax shields, is then computed separately.

In some situations, you may still desire an accurate representation of the cost of capital. In these cases, split hybrid securities into their individual components. For instance, you can replicate a convertible bond by combining a traditional bond with a call option on the company's stock. You can further disaggregate a call option into a portfolio consisting of a risk-free bond and the company's stock. By converting a complex security into a portfolio of debt and equity, you once again have the components required for the traditional cost of capital. The process of creating replicating portfolios to value options is discussed in Chapter 35.

CLOSING THOUGHTS

The cost of capital is one of the most hotly debated topics in the field of finance. While robust statistical techniques have improved our understanding of the issue, a practical measurement of the cost of capital remains elusive. Nonetheless, we believe the steps outlined in this chapter, combined with a healthy perspective of long-term trends, will lead to a cost of capital that is reliable and reasonable. Even so, do not let a lack of precision overwhelm you. A company creates value when ROIC exceeds the cost of capital, and for many of our clients, the variation in ROIC across projects greatly exceeds any variation in the cost of capital. Smart selection based on forward-looking ROIC often generates most of the impact in day-to-day decision making.

14

Moving from Enterprise Value to Value per Share

When you have completed the valuation of core operations, as described in Chapter 8, you are ready to estimate enterprise value, equity value, and value per share. Enterprise value represents the value of the entire company, while equity value represents the portion owned by shareholders. To determine enterprise value, add to the value of core operations the value of nonoperating assets, such as excess cash and nonconsolidated subsidiaries. To convert enterprise value to equity value, subtract short-term and long-term debt, debt equivalents (such as unfunded pension liabilities), and hybrid securities (such as employee stock options). Finally, to estimate value per share, divide the resulting equity value by the most recent number of undiluted shares outstanding.

A nonoperating asset is any asset whose value is *not* included in adjusted earnings before interest, taxes, and amortization (EBITA) and consequently excluded from free cash flow.[1] Common nonoperating assets are excess cash, nonconsolidated subsidiaries (also known as equity investments and noncontrolling interests), excess pension assets, discontinued operations, and financial subsidiaries. The enterprise value, including the value of operations plus nonoperating assets, represents the total value of the company that can be allocated among the various claim holders.

Nonequity claims are financial claims against enterprise value whose expenses are not included in EBITA and consequently excluded from free cash flow. Double-counting an expense and its associated liability would bias your valuation downward. The most typical nonequity claims—bank loans and

[1] Double-counting the value of an asset will lead to an overestimate of value. For instance, some analysts who follow retailers add the value of real estate to the value of core operations. Since the real estate is required to conduct business, its benefits are already embedded in the value of operations. The value of real estate can be added to core operations only if the company is charged a market-based rent in free cash flow.

EXHIBIT 14.1 **Sample Comprehensive Valuation Buildup**

$ million

DCF value of operations	5,000	
Excess cash and marketable securities	50	Nonoperating assets
Excess real estate	5	
Nonconsolidated subsidiaries	270	
Financial subsidiary	300	
Tax loss carryforwards	10	
Discontinued operations	30	
Enterprise value	5,665	
Interest-bearing debt		Debt and debt equivalents
Bank loans	(250)	
Bonds	(550)	
Debt equivalents		
Operating leases	(250)	
Securitized receivables	(50)	
Unfunded pension liabilities	(150)	
Long-term operating provisions	(50)	
Nonoperating provisions	(75)	
Contingent liabilities	(40)	
Debt and debt equivalents	(1,415)	
Hybrid claims		Hybrid claims and noncontrolling interests
Convertible debt	(200)	
Preferred stock	(100)	
Employee stock options	(50)	
Noncontrolling interests	(150)	
Equity value	3,750	

corporate bonds—are reported on the balance sheet. But off-balance-sheet debt, such as operating leases, securitized receivables, and contingent claims, are not, and must be estimated separately. Hybrid securities, such as preferred stock, convertible debt, and employee options, have characteristics of both debt and equity. Such hybrids require special care, as their valuations are highly dependent on enterprise value, so you should value them using option-pricing models rather than book value.[2] Finally, if other shareholders have noncontrolling interests against certain consolidated subsidiaries, deduct the value of the noncontrolling interests.

This chapter lays out the process for converting core operating value—based on discounted cash flow (DCF)—into enterprise value and subsequently into equity value. Exhibit 14.1 details the valuation buildup for a complex

[2]For investment-grade companies, the value of debt is driven mostly by interest rates. In this case, there will be little interdependence between the value of core operations and debt. For distressed companies, default risk also drives the value of debt. In this case, interdependence will be high and must be modeled. We discuss highly levered companies later in the chapter.

hypothetical company to demonstrate a comprehensive analysis of nonoperating items. Using the valuation buildup as our framework, the chapter goes step-by-step through the process of valuing nonoperating assets, debt and debt equivalents, hybrid securities, and noncontrolling interests, ending with the final step in valuation—estimating the intrinsic value per share.[3]

VALUING NONOPERATING ASSETS

Although not included in operations, nonoperating assets still represent value to the shareholder. Thus, you must estimate the market value of each nonoperating asset separately and add the resulting value to the DCF value of operations to arrive at enterprise value. If necessary, adjust for circumstances that could affect shareholders' ability to capture the full value of these assets. For example, if the company has announced it will sell off a nonoperating asset in the near term, deduct the estimated capital gains taxes (if any) on the asset from its market value. If ownership of the asset is shared with another company, include only your company's portion of the value.

This section identifies the most common nonoperating assets and describes how to handle them in the valuation.

Excess Cash and Marketable Securities

As discussed in Chapter 9, companies often hold more cash and marketable securities than they need to run the business on a daily basis. You need to make an estimate of how much the business needs for operations. The remaining cash and marketable securities are treated as nonoperating. As a rule of thumb, we often assume that a company requires about 2 percent of revenues in cash to operate the business. The remaining cash and marketable securities are considered excess.

Companies hold excess cash for a number of reasons, parking it in short-term securities until they can invest it or return it to shareholders. American companies hold significant amounts of excess cash when they have substantial earnings outside the United States. They are reluctant to repatriate cash because they are required to pay any difference in taxes upon repatriation. Instead, they wait (and hope) for a change in tax laws, such as tax amnesty on repatriated earnings. We estimate that at the end of 2014, U.S. companies held at least $1.5 trillion of cash outside the United States.

Cash and marketable securities are reported on a company's balance sheet at fair market value. You can use their book value in your valuation, unless

[3]Estimating the value per share completes the technical aspect of the valuation, yet the job is not complete. It is time to revisit the valuation with a comprehensive look at its implications. We examine this process in Chapter 15.

you have reason to believe they have significantly changed in value since the reporting date (as in the limited case of volatile equity holdings).

Nonconsolidated Subsidiaries, Noncontrolling Interests, and Equity Investments

Nonconsolidated subsidiaries, also referred to as noncontrolling interests or equity investments, are companies in which the parent company holds a noncontrolling equity stake. Because the parent company does not have control over these subsidiaries, their financials are not consolidated, so these investments must be valued separately from operations. Under U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS), there are two ways in which nonconsolidated subsidiaries can appear in the parent company's accounts:

1. For equity stakes in which the parent company has influence but lacks control (often between 20 percent and 50 percent ownership), the equity holding in the subsidiary is reported in the parent's balance sheet at the investment's historical cost plus any reinvested income. The parent company's portion of the subsidiary's profits is shown below operating profit on the parent's income statement.
2. For equity stakes below 20 percent, the parent company is assumed to have no influence. The equity holdings are shown at historical cost on the parent's balance sheet. The parent's portion of the subsidiary's *dividends* is included below operating profit on the income statement.

In response to the accounting and financial scandals of the early 2000s, global accounting moved away from absolute thresholds to consolidation methods that rely on the parent's influence around key activities and exposure to gains and losses. Implementation has been complex, and companies can report under multiple standards. Always investigate the notes to determine which investments contribute to EBITA and which do not.[4]

Publicly traded subsidiaries If the subsidiary is publicly listed, use the market value to determine the value of the company's equity stake. Verify that the market value is indeed a good indicator of intrinsic value. In some cases, these listed subsidiaries have very limited free float and/or very low liquidity, so the share price may not properly reflect current information.

Exhibit 14.2 presents the equity investments held by Coca-Cola. Since Coca-Cola does not control these companies, their revenue, income, and assets

[4]In its 2013 annual report, Philips reported, "Among the consolidated [subsidiaries] is one entity where the Company owns 44 percent of the voting power. We have determined that the Company controls this entity on a de facto power basis."

EXHIBIT 14.2 **Coca-Cola Company: Publicly Traded Equity Investments, December 2013**

$ million

	Book value	Fair value
Coca-Cola FEMSA, S.A.B. de C.V.	2,247	7,098
Coca-Cola Amatil Limited	854	2,459
Coca-Cola HBC AG	1,467	2,429
Coca-Cola İçecek A.Ş.	233	1,324
Coca-Cola East Japan Bottling Company, Ltd.	507	849
Embotelladora Andina S.A.	362	569
Coca-Cola Bottling Co. Consolidated	85	182
Total	5,755	14,910

Valuation of Coca-Cola Amatil Limited	
Market capitalization, AU $ million	9,186
Times: Percent ownership, %	29.2
Ownership stake, AU $ million	2,682
Times: Currency conversion, US $/AU $	0.917
Ownership stake	2,459

Source: Coca-Cola Company annual report, 2013; Google Finance; Exchange-Rates.org.

are not consolidated on Coca-Cola's financial statements. Therefore, each investment must be valued separately and added to Coca-Cola's value of operations to determine enterprise value.

In the management discussion and analysis section of its 2013 annual report, Coca-Cola reports both book value and market value for its equity investments. Therefore, if you are valuing Coca-Cola near its fiscal-year close, the valuation from the annual report will suffice. As the year progresses, however, these data become stale, and each investment must be revalued. For example, consider Coca-Cola Amatil, Coca-Cola's bottler in Australia. To value this equity stake, multiply the equity value for Coca-Cola Amatil (AU $9,186 million) by Coca-Cola's ownership percentage (29.2 percent). The resulting ownership stake equals AU $2,682 million. Since Coca-Cola reports in U.S. dollars, the stake must be converted into U.S. dollars at the prevailing exchange rate. Multiplying AU $2,682 million by 0.917 equals the value of Coca-Cola's ownership of Coca-Cola Amatil ($2,459 million).

Although this valuation was accurate as of December 31, 2013, the valuation subsequently fell. During 2014, revenue growth at Coca-Cola Amatil slowed, and the company's market capitalization fell 25 percent over the course of the next year. In addition, the Australian dollar weakened from 0.917 U.S. dollars per Australian dollar to 0.814. Combining the two effects, the value of Coca-Cola's stake in Coca-Cola Amatil fell from $2,459 million to $1,652 million during 2014. A December 2014 valuation of Coca-Cola must reflect this change in value.

Privately held subsidiaries If the subsidiary is not listed but you have access to its financial statements (for instance, through a public bond offering or private disclosure), perform a separate DCF valuation of the equity stake. Discount the cash flows at the appropriate cost of capital (which, as before, is not necessarily the parent company's weighted average cost of capital). Also, when completing the parent valuation, include only the value of the parent's equity stake and not the subsidiary's entire enterprise value or equity value.

If the parent company's accounts are the only source of financial information for the subsidiary, we suggest the following alternatives to DCF:

- *Simplified cash-flow-to-equity valuation:* This is a feasible approach when the parent has a 20 to 50 percent equity stake, because the subsidiary's net income and book equity are disclosed in the parent's accounts.[5] Build forecasts for how the equity-based key value drivers (net income growth and return on equity) will develop, so you can project cash flows to equity. Discount these cash flows at the *cost of equity* for the subsidiary in question and not at the parent company's cost of capital.
- *Multiples valuation:* As a second alternative, estimate the partial stake using a price-to-earnings and/or market-to-book multiple. If the company owns 20 to 50 percent of the subsidiary, apply an appropriate multiple to reported income.
- *Tracking portfolio:* For parent equity stakes below 20 percent, you may have no information beyond the investment's original cost—that is, the book value shown in the parent's balance sheet. Even applying a multiple is difficult because neither net income nor the current book value of equity is reported. If you know when the stake was acquired, you can approximate its current market value by applying the relative price change for a portfolio of comparable stocks over the same holding period.[6]

You should triangulate your results as much as possible, given the lack of precision for these valuation approaches.

Finance Subsidiaries

To make their products more accessible, some companies operate customer financing businesses.[7] Because financial subsidiaries differ greatly from manufacturing and services businesses, it is critical to separate revenues, expenses,

[5]The book value of the subsidiary equals the historical acquisition cost plus retained profits, which is a reasonable approximation of book equity. If goodwill is included in the book value of the subsidiary, this should be deducted.

[6]For example, to value Liberty Global's £481 million investment in British broadcaster ITV to acquire a 6.4 percent stake, create a matching investment in a portfolio of satellite companies, such as DirecTV and Dish Network. Assuming that valuations track one another, this will provide an approximation for the stake's value.

[7]Companies that sell expensive products typically offer financing of purchases. Significant customer financing subsidiaries exist at Caterpillar, IBM, and Textron, among others.

and balance sheet accounts associated with the subsidiary from core operations. Failing to do so will distort return on invested capital, free cash flow, and ultimately your perspective on the company's valuation.

Once the finance subsidiary is separated from operations, use the reorganized financial statements to value the subsidiary as if it were a financial institution. Add this value to the value of core operations to determine enterprise value. Since the finance subsidiary's debt will already be incorporated into your valuation, do not subtract total debt from the parent company's enterprise value to determine equity value. Doing so would double-count the value of debt and underestimate the company's value.

This book presents the valuation of a company with a finance subsidiary in Chapter 17, and covers bank valuation in Chapter 34.

Loans to Other Companies

For loans to nonconsolidated subsidiaries and other companies, use the reported book value. This is a reasonable approximation of market value if the loans were given at fair market terms and if the borrower's credit risk and general interest rates have not changed significantly since issuance. If this is not the case and the investment is substantial, you should perform a separate DCF valuation of the promised interest and principal payments at the yield to maturity for corporate bonds with similar risk and maturity.

Discontinued Operations

Discontinued operations are businesses being sold or closed down. The earnings from discontinued operations are explicitly shown in the income statement, and the associated net asset position is disclosed on the balance sheet. Because discontinued operations are no longer part of a company's operations, their value should not be modeled as part of free cash flow or included in the DCF value of operations. Under U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS), the assets and liabilities associated with the discontinued operations are written down to their fair value and disclosed as a net asset on the balance sheet, so the most recent book value is usually a reasonable approximation.[8]

Excess Real Estate

Excess real estate and other unutilized assets are assets no longer required for the company's operations. As a result, any cash flows that the assets could

[8]Any upward adjustment to the current book value of assets and liabilities is limited to the cumulative historical impairments on the assets. Thus, the fair market value of discontinued operations could be higher than the net asset value disclosed in the balance sheet.

generate are excluded from the free-cash-flow projection, and the assets are not included in the DCF value of operations. Identifying these assets in an outside-in valuation is nearly impossible unless they are specifically disclosed in the company's footnotes. For that reason, only internal valuations are likely to include their value separately as a nonoperating asset. For excess real estate, use the most recent appraisal value when it is available. Alternatively, estimate the real estate value either by using a multiple, such as value per square meter, or by discounting expected future cash flows from rentals at the appropriate cost of capital. Of course, be careful to exclude any operating real estate from these figures, because that value is implicitly included in the free-cash-flow projections and value of operations.

We do not recommend a separate valuation for unutilized operating assets unless they are expected to be sold in the near term. If the financial projections for the company reflect growth, the value of any underutilized assets should instead be captured in lower future capital expenditures.

Tax Loss Carryforwards

As detailed in Chapter 18, there are three types of deferred-tax assets (DTAs): operating DTAs, nonoperating DTAs, and tax loss carryforwards, as they are called in the United States. Only tax loss carryforwards should be valued separately.[9] Tax loss carryforwards are the tax credits generated by past losses. They can be used to lower future taxes.

To value tax loss carryforwards, create a separate account for the accumulated tax loss carryforwards, and forecast the development of this account by adding any future losses and subtracting any future taxable profits on a year-by-year basis. For each year in which the account is used to offset taxable profits, discount the tax savings at the cost of debt. Some practitioners simply set the carryforwards' value at the tax rate times the accumulated tax losses.

Excess Pension Assets

Surpluses in a company's pension funds show up as net pension assets on the balance sheet. (Small amounts are typically embedded within other assets.) Following recent changes to U.S. accounting standards, excess pension assets

[9] Operating deferred-tax assets (DTAs), such as those corresponding to self-insurance, are incorporated directly into net operating profit less adjusted taxes (NOPLAT) and subsequently free cash flow. Therefore, operating DTAs should not be valued separately. Nonoperating DTAs, such as pension-related DTAs, should be ignored. Instead, value the future tax burden (or relief) associated with the nonoperating asset as part of the nonoperating asset. For instance, pension DTAs represent taxes that were paid when historical contributions exceeded recognized expenses. Since past taxes paid are unrelated to future cash savings, they are irrelevant to valuation. Future cash savings are based on the current level of pension underfunding.

are typically reported at market value.[10] On an after-tax basis, the pension's value depends on management's plans. If pensions are expected to be dissolved soon, subtract liquidation taxes (typically set higher than the marginal tax rate) from the market value of excess pension assets. Otherwise, subtract taxes at the marginal rate (which reflects the need for lower future contributions). For details on pension accounting and valuation, see Chapter 20.

VALUING DEBT AND DEBT EQUIVALENTS

With enterprise value in hand, subtract the value of debt and debt equivalents (nonequity financial claims), which are typically found in the liabilities section of the balance sheet. Remember, deduct only those financial claims that are not incorporated as part of free cash flow. Also, be aware that not all financial claims have to be reported on the balance sheet, so make sure to search the footnotes carefully for undisclosed liabilities.

This section goes through the most typical financial claims and how to determine their value.

Debt

Corporate debt comes in many forms: commercial paper, notes payable, fixed and floating bank loans, corporate bonds, and capitalized leases. For companies with investment-grade debt, the value of debt will be independent of the value of operations. Consequently, each value can be estimated separately. For highly levered companies and companies in distress, this is not the case. In these situations, the value of debt will be linked to value of core operations, and both values must be determined simultaneously.

Investment-grade debt If the debt is relatively secure and actively traded, use the market value of debt.[11] If the debt instrument is not traded, estimate current value by discounting the promised interest payments and the principal repayment at a yield to maturity that reflects the riskiness of the debt (typically based on the company's bond rating). The book value of debt is a reasonable approximation for fixed-rate debt if interest rates and default risk have not significantly changed since the debt issuance. For floating-rate debt, value is

[10] Under IFRS, companies can still report excess pension assets at book value. If pensions are not marked to market, search the company's pension footnote for the value of excess pension assets.

[11] When a bond's yield is below its coupon rate, the bond will trade above its face value. Intuition dictates that, at most, the bond's face value should be deducted from enterprise value. Yet since enterprise value is computed using the cost of debt (via the weighted average of cost of capital), subtracting face value is inconsistent with how enterprise value is computed. In cases where bonds are callable at face value, market prices will rarely exceed face value.

EXHIBIT 14.3 **Valuation of Equity Using Scenario Analysis**

$ million

	Enterprise value	Face value of debt	Equity value[1]	Probability, %	Weighted equity value
Scenario A					
New owner successfully implements value improvements.	1,500	1,200	300	50	150
Scenario B					
Company maintains current performance.	900	1,200	–	50	–
				Equity value	150

[1] Equity value equals enterprise value less the face value of debt or zero, whichever is greater.

not sensitive to interest rates, and book value is a reasonable approximation if the company's risk of default has been fairly stable.

If you are using your valuation model to test changes in operating performance (for instance, a new initiative that will improve operating margins), the value of debt under your new assumptions may differ from its current market value. Always check interest coverage ratios to test whether the company's bond rating will change under the new forecasts—often it will not. A change in bond rating can be translated into a new yield to maturity for debt, which in turn will allow you to revalue the debt. For more on debt ratings and interest rates, see Chapter 29.

Highly levered companies For companies with significant debt or companies in financial distress, valuing debt requires careful analysis. For distressed companies, the value of the debt will be at a significant discount to its book value and will fluctuate with the value of the enterprise. Essentially, the debt has become similar to equity: its value will depend directly on your estimate for the enterprise value, and you should not simply deduct the current market value of the debt.

For distressed companies, apply an integrated-scenario approach to value operations as well as equity. Exhibit 14.3 presents a simple two-scenario example of equity valuation with significant debt. In scenario A, the company's new owner is able to implement improvements in operating margin, inventory turns, and so on. In scenario B, changes are unsuccessful, and performance remains at its current level. For each scenario, estimate the enterprise value conditional on your financial forecasts, deduct the *full value* of the debt and other nonequity claims,[12] and calculate the equity value as the residual (which should be zero for any scenario where the conditional enterprise value is less

[12] The full value of the debt means the market value of debt for a nondistressed company—typically close to book value. In addition, all nonequity claims need to be included in the scenario approach for distressed companies. The order in which nonequity claims are paid upon liquidation will make a difference for the value of nonequity claims but not for the equity value.

than the value of debt plus other nonequity claims). Next, weight each scenario's conditional value of equity by its probability of occurrence to obtain an estimate for the value of equity. For the company in Exhibit 14.3, scenario A leads to an equity valuation of $300 million, whereas the equity value in scenario B is zero. If the probability of each scenario is 50 percent, the weighted average value of equity is $150 million.

The scenario valuation approach treats equity like a call option on enterprise value. A more comprehensive model would estimate the entire distribution of potential enterprise values and use an option-pricing model, such as the Black-Scholes model, to value equity.[13] Using an option-pricing model rather than scenario analysis to value equity, however, has serious practical drawbacks. First, to model the distribution of enterprise values, you must forecast the expected change and volatility for each source of uncertainty, such as revenue growth and gross margin. This too easily becomes a mechanical exercise that replaces a thoughtful analysis of the underlying economics of potential scenarios. Second, most options models treat each source of uncertainty as independent of the others. This can lead to outcomes that are economically unrealistic. For these reasons, we believe a thoughtful scenario analysis will lead to a more accurate valuation than an options model will.

Operating Leases

Under certain restrictions, companies can avoid capitalizing leased assets on their balance sheets. Instead, they treat rental charges for so-called operating leases as an expense. Chapter 9 outlined a method for capitalizing leased assets. If net operating profit less adjusted taxes (NOPLAT), invested capital, and consequently free cash flow are adjusted for operating leases, you must deduct the present value of operating leases from enterprise value to determine equity value. Do *not* subtract the value of operating leases, however, if no adjustments are made. Chapter 20 details the valuation of leases.

Securitized Receivables

When companies sell accounts receivable to a third party, the discount on the sale is typically embedded in interest expense. Since these discounts will not be captured in free cash flow or the cost of capital, deduct the value of securitized receivables from enterprise value to determine equity value. In limited cases, these discounts will be embedded in an operating line item by the company. In these situations, reclassify the discount as interest, recapitalize the securitized receivable, and deduct the value of the receivable from enterprise value to

[13]Chapter 35 describes option-pricing models.

determine equity value. Chapter 20 discusses the impact of securitized receivables in detail.

Unfunded Pension and Other Retirement Liabilities

Unfunded pension and other retirement liabilities should be treated as debt equivalents and deducted from enterprise value to determine equity value. Since the future contributions to fill unfunded liabilities are tax deductible at the marginal tax rate, multiply unfunded pension liabilities by 1 minus the marginal tax rate. For details on pension accounting and valuation, see Chapter 20.

Provisions

Certain provisions other than retirement-related liabilities must be deducted as debt equivalents. Following the guidelines in Chapter 9, we distinguish four types of provisions and value them as follows:

1. Ongoing operating provisions (e.g., for warranties and product returns) are already accounted for in the free cash flows and therefore *should not be deducted* from enterprise value.
2. Long-term operating provisions (e.g., for plant-decommissioning costs) *should be deducted* from enterprise value as debt equivalents. Because these provisions cover cash expenses that are payable in the long term, they are recorded at the discounted value in the balance sheet. In this case, there is no need to perform a separate DCF analysis, and you can *use the book value of the liability* in your valuation.[14]
3. Nonoperating provisions (e.g., for restructuring charges resulting from layoffs) *should be deducted* from enterprise value as a debt equivalent. Although a discounted value would be ideal, the book value from the balance sheet is often a reasonable approximation. These provisions are recorded on the financial statements at a nondiscounted value, because outlays are usually in the near term.
4. Income-smoothing provisions do not represent actual future cash outlays, so they *should not be deducted* from enterprise value. These provisions are difficult to find and will disappear as companies around the world adopt IFRS.

[14]The company will also recognize a decommissioning asset at the time of initial investment. The decommissioning asset is already incorporated into free cash flow, so no adjustment for the asset is required.

For specifics on how to identify, analyze, and value provisions, see Chapter 19.

Contingent Liabilities

Certain liabilities are not disclosed in the balance sheet but are separately discussed in the notes to the balance sheet. Examples are possible liabilities from pending litigation and loan guarantees. When possible, estimate the associated expected after-tax cash flows (if the costs are tax deductible), and discount these at the cost of debt. Unfortunately, assessing the probability of such cash flows materializing is difficult, so the valuation should be interpreted with caution. To provide some boundaries on your final valuation, estimate the value of contingent liabilities for a range of probabilities.

VALUING HYBRID SECURITIES AND NONCONTROLLING INTERESTS

For stable companies, the current values of debt and debt equivalents are typically independent of enterprise value. For hybrid securities and minority interests, this is not the case. Each must be valued in conjunction with estimates of enterprise value. The most common hybrid securities are convertible debt, convertible preferred stock, and employee stock options.

Convertible Debt and Convertible Preferred Stock

Convertible bonds are corporate bonds that can be exchanged for common equity at a predetermined conversion ratio. A convertible bond is essentially a package of a straight corporate bond plus a call option on equity (the conversion option).[15] Because the conversion option can have significant value, this form of debt requires treatment different from that of regular corporate debt.

The value of convertibles depends on the enterprise value. In contrast to straight debt, neither the book value nor the simple DCF value of bond cash flows is a good proxy for the value of convertibles. Depending on the information available, there are three potential methods:

1. *Market value:* If your estimate of value per share is near the market price and the convertible bond is actively traded, use its market value. If you plan to modify enterprise value (via operating changes), the market

[15]See R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 8th ed. (New York: McGraw-Hill, 2006), chap. 23. If you are doing a DCF-to-equity valuation, you subtract only the value of the conversion option from your DCF valuation. The straight-debt component of the convertible debt has already been included in the equity cash flows.

EXHIBIT 14.4 **Intel Convertible Debt, December 2014**

$ million

Capital structure	Market value	Black-Scholes value	Conversion value	Book value	Principal outstanding
Enterprise value	198,000	198,000	198,000		
Traditional debt	(11,690)	(11,690)	(11,690)	11,425	11,425
→ Convertible debt at 2.95% due 2035	(2,117)	(2,265)	–	946	1,600
→ Convertible debt at 3.25% due 2039	(3,500)	(3,361)	–	1,075	2,000
Unfunded pensions	(1,292)	(1,292)	(1,292)	1,292	
Employee options	(2,085)	(2,085)	(2,085)		
Equity value	177,316	177,307	182,933		
Number of shares, million					
Number of nondiluted shares	4,857	4,857	4,857		
→ New shares issued	–	–	147		
Number of diluted shares	4,857	4,857	5,004		
Value per share, $	36.51	36.51	36.56		

Source: Intel 2013 10-K, FINRA TRACE system, Black-Scholes option-pricing model.

value is no longer appropriate, as convertible debt value will change with enterprise value.

2. *Black-Scholes value:* When the market value is inappropriate, we recommend using an option-based valuation for convertible debt. In contrast to the treatment of employee stock options, annual reports do not provide any information on the value of convertible debt. Accurate valuation of convertible bonds with option-based models is not straightforward, but following methods outlined by DeSpiegeleer and Schoutens, you can apply an adjusted Black-Scholes option-pricing model for a reasonable approximation.[16]
3. *Conversion value:* The conversion value approach assumes that all convertible bonds are immediately exchanged for equity and ignores the time value of the conversion option. It leads to reasonable results when the conversion option is deep in the money, meaning the bond is more valuable when converted into equity than when held for future coupon and principal payments.

Exhibit 14.4 illustrates all three valuation methods for the semiconductor company Intel. The first column values Intel's equity using the market price of each bond. Market prices for U.S. corporate debt are reported on the Financial Industry Regulatory Authority (FINRA) Trade Reporting and Compliance

[16]For more on the valuation of convertible debt, see, for example, J. DeSpiegeleer and W. Schoutens, *The Handbook of Convertible Bonds: Pricing, Strategies and Risk Management* (New York: John Wiley & Sons, 2011).

Engine (TRACE) system.[17] In December 2014, Intel's traditional debt traded close to its book value. In contrast, the company's convertible debt traded at a significant premium. For instance, the convertible debt due in 2035 traded at $2,117 million in December 2014 versus $946 million in book value.

This difference between book and market values occurred for two reasons. First, when bonds can be settled in cash, a 2008 accounting rule requires that a portion of the bond be allocated to equity.[18] Since the book value of equity is not used in DCF valuation, this can lead to a significant underestimation of value. Second, the conversion feature has value. According to Intel's annual report, the bonds maturing in 2035 are convertible at $28.90 per share.[19] At this conversion price, $1,600 million in outstanding principal is convertible into 55.36 million shares. With Intel's stock trading at $36 in December 2014, the bonds can be converted into the equivalent of $1,993 million (known as intrinsic value) in shares. The convertible bond's market price ($2,117 million) trades higher than the bond's intrinsic value, given the unlimited upside and downside protection the bonds offer.

To model the value of Intel's convertible debt, disaggregate the value of convertible debt into underlying straight debt and the option value to convert. For the bond maturing in 2035, the value of straight debt equals the net present value of a 2.95 percent coupon bond yielding 4.26 percent (the yield on comparable bonds without conversion features), maturing in 22 years (the remaining life). Without conversion, this bond is valued at 87.8 percent of face value, or $1,405 million.[20]

To determine an option's value, you need six inputs: the underlying asset value, the strike price, the volatility of the underlying asset, the risk-free rate, the time to maturity, and the dividend rate on the underlying asset. For the option embedded in Intel's convertible bond, the underlying asset is 55.36 million shares of Intel stock, whose current value equals $1,993 million (55.36 million shares times $36 per share). The strike price, which represents what the investor must pay to receive the shares, equals the current value of straight debt, currently valued at $1,405 million. The volatility of Intel shares (22.0 percent) is reported in the company's 10-K. The bond's time to maturity is 22 years, and the current risk-free rate is 2.54 percent.[21] Because the convertible debt is

[17] Developed by FINRA, the TRACE system facilitates the mandatory reporting of over-the-counter market transactions for eligible debt securities in the United States. It is available to the public via FINRA's website.

[18] In 2008, FASB adopted FASB Staff Position (FSP) Accounting Principles Board (APB) 14-1, "Accounting for Convertible Debt Instruments That May Be Settled in Cash upon Conversion (Including Partial Cash Settlement)."

[19] Reported in Intel's 2013 annual report, note 16: Borrowings.

[20] Without the conversion feature, the bond would trade at a discount to face value, because the bond's coupon is well below its yield to maturity. For companies with low debt ratings, this discount can be substantial.

[21] Intel's convertible debt is not callable, so the remaining maturity can be used in the options valuation. If the debt is callable, this must be incorporated into the bond's valuation.

partially protected against dividends, the dividend rate equals the current dividend yield less the rate of expected protection. We estimated the residual value at 1.5 percent.

Inputting the data into a Black-Scholes estimator leads to an option value of $860 million. Thus, the Black-Scholes value of the convertible debt equals $2,265 million ($1,405 in straight debt plus $860 in option value).

A simple alternative to option pricing is the conversion value approach. Under the conversion value approach, convertible bonds are converted immediately into equity. Since Intel's bonds are convertible into 147 million shares (55 million shares from the convertible debt due in 2035 and 92 million shares from the convertible debt due in 2039), nondiluted shares are increased from 4,857 million to 5,004 million. The third column of Exhibit 14.4 zeros out convertible debt and divides by diluted shares.

In this case, each approach leads to a similar value because the value of conversion is much higher than the value of traditional debt (known as being in the money). For bonds out of the money, the conversion approach will lead to an underestimation of the bonds' value. Therefore, we recommend using an option valuation model, such as Black-Scholes.

Employee Stock Options

Many companies offer their employees stock options as part of their compensation. Options give the holder the right, but not the obligation, to buy company stock at a specified price, known as the exercise price. Since employee stock options have long maturities and the company's stock price could eventually rise above the exercise price, options can have great value.

Employee stock options affect a company valuation in two ways. First, the value of options that will be *granted in the future* needs to be captured in the free-cash-flow projections or in a separate DCF valuation, following the guidelines in Chapter 9. If captured in the free-cash-flow projections, the value of future options grants is included in the value of operations and should not be treated as a nonequity claim. Second, the value of options *currently outstanding* must be subtracted from enterprise value as a nonequity claim. Note, however, that the value of the options will depend on your estimate of enterprise value, and your option valuation should reflect this.

The following approaches can be used for valuing employee options:

- We recommend using the *estimated market value from option valuation models*, such as Black-Scholes or more advanced binomial (lattice) models. Under U.S. GAAP and IFRS, the notes to the balance sheet report the total value of all employee stock options outstanding, as estimated by such option-pricing models. Note that this value is a good approximation only if your estimate of share price is close to the one underlying the option values in the annual report. Otherwise, you need to create a

EXHIBIT 14.5 **Intel Employee Options, December 2014**

$ million

Capital structure	Black-Scholes: Value of outstanding options	Black-Scholes: Value of exercisable options	Exercise value approach
Enterprise value	198,000	198,000	198,000
Traditional debt	(11,690)	(11,690)	(11,690)
Convertible debt at 2.95% due 2035	(2,117)	(2,117)	(2,117)
Convertible debt at 3.25% due 2039	(3,500)	(3,500)	(3,500)
Unfunded pensions	(1,292)	(1,292)	(1,292)
→ Employee options: value	(2,085)	(1,600)	–
→ Employee options: exercise proceeds	–	–	2,258
Equity value	177,316	177,800	181,659
Number of shares, million			
Number of nondiluted shares	4,857.0	4,857.0	4,857.0
→ New shares issued	–	–	111.5
Number of diluted shares	4,857.0	4,857.0	4,968.5
Value per share, $	36.51	36.61	36.56

Source: Intel 2013 10-K, FINRA TRACE system, Black-Scholes option-pricing model.

new valuation using an option-pricing model.[22] The notes disclose the information required for valuation.

- The *exercise value approach* provides only a lower bound for the value of employee options. It assumes that all options are exercised immediately and thereby ignores the time value of the options. The resulting valuation error increases as options have longer time to maturity, the company's stock has higher volatility, and the company's share price is closer to the exercise price. Given that a more accurate valuation is already disclosed in the annual report, we do not recommend this method. However, it is still quite common among practitioners.

Exhibit 14.5 provides an example of the two valuation methods. The first method uses Black-Scholes to value both outstanding and currently exercisable options. The value of outstanding options will be less than that of exercisable options because outstanding options include some options that will be lost if the employee leaves the company.

To estimate the value of employee stock options, you need six inputs: the current stock price, the average strike price, the stock's volatility, the risk-free rate, the time to maturity, and the stock's dividend rate. In this example, Intel's

[22]For more on the valuation of employee stock options, see, for example, J. Hull and A. White, "How to Value Employee Stock Options," *Financial Analysts Journal* 60, no. 1 (January/February 2004): 114–119.

current share price equals $36. The other inputs are disclosed in Intel's 10-K for both outstanding and exercisable options. For outstanding options, the weighted average strike price equals $21, the volatility of Intel's shares equals 25 percent, and the average time to maturity is reported at 5.2 years. The current risk-free rate over five years is 1.66 percent, and the expected dividend rate equals 1.97 percent. The Black-Scholes estimator prices the average option at $13.8.[23] With 151.1 million options outstanding, the aggregate value of options is valued at $2,085 million. To estimate share price, deduct the aggregate value from enterprise value, and divide by the number of undiluted shares. Since some outstanding options will go unclaimed, repeat the process for just exercisable options. The actual value will fall somewhere between the outstanding and exercisable values.

Under the exercise value approach, employee options are assumed to be exercised immediately. According to Intel's 10-K, 111.5 million shares are immediately exercisable at an average strike price of $20.25, for total proceeds of $2,258 million. Exercise of employee options generates cash for the company and increases shares outstanding from 4,857.0 million to 4,968.5 million. Dividing equity value by diluted shares leads to a value of $36.56, slightly lower than the value under the Black-Scholes method.

Noncontrolling Interests

When a company controls a subsidiary but does not fully own it, the subsidiary's financial statements must be fully consolidated in the group accounts. The subsidiary's assets and liabilities will be indistinguishable from the parent company's accounts, but the portion of the subsidiary's equity not owned by the parent company will be separated from other equity accounts as noncontrolling interest.[24] Since the full value of the subsidiary will be incorporated into the value of operations, a valuation adjustment must be made for the portion of the subsidiary not owned by the parent company being valued.

Because noncontrolling interests are to a certain extent the mirror image of nonconsolidated subsidiaries, the recommended valuation for noncontrolling interests is similar to that of nonconsolidated subsidiaries; see the corresponding section for more details. In the case of a minority carve-out (in which the consolidated—but not fully owned—subsidiary is publicly traded), deduct the proportional market value owned by outsiders from enterprise value to determine equity value. Alternatively, you can perform a separate valuation using a DCF approach, multiples, or a tracking portfolio, depending on the amount

[23]Using Black-Scholes to determine the value of a single option on an average strike price will undervalue a portfolio of options with a spread of strike prices. Unless you know the spread of strike prices, you cannot measure the bias.

[24]For example, Berkshire Hathaway reported $2,595 million in noncontrolling interests in 2013. This figure can be found on the company's balance sheet under shareholders' equity.

of information available. Remember, however, that a noncontrolling interest is a claim on a subsidiary, not the entire company. Thus, any valuation should be directly related to the subsidiary and not the company as a whole.

ESTIMATING VALUE PER SHARE

The final step in a valuation is to calculate the value per share. Assuming that you have used an option-based valuation approach for convertible bonds and employee options, divide the total equity value by the number of *undiluted* shares outstanding. Use the undiluted (rather than diluted) number of shares because the full values of convertible debt and stock options have already been deducted from the enterprise value as nonequity claims. Also, use the most recent number of undiluted shares outstanding. Do not use the weighted average of shares outstanding; they are reported in the financial statements to determine average earnings per share.

The number of shares outstanding is the gross number of shares issued, less the number of shares held in treasury. Most U.S. and European companies report the number of shares issued and those held in treasury under shareholders' equity. However, some companies show treasury shares as an investment asset, which is incorrect from an economic perspective. Treat them instead as a reduction in the number of shares outstanding.

If you used the conversion and exercise value method to account for employee options and convertible debt, divide by the diluted number of shares.

With value per share in hand, you have completed the mechanics of your valuation. But the job is not done. The next two chapters discuss how to stress-test your valuation using integrated scenarios and trading multiples.

15

Analyzing the Results

Now that the valuation model is complete, we are ready to put it to work. Start by testing its validity. Even a carefully planned model can have mechanical errors or flaws in economic logic. To help you avoid such troubles, we present a set of systematic checks and other tricks of the trade that test the model's sturdiness. During this verification, you should also ensure that key ratios are consistent with the economics of the industry.

Once you are comfortable that the model works, learn the ins and outs of your valuation by changing each forecast input one at a time. Examine how each part of your model changes, and determine which inputs have the largest effect on the company's valuation, and which have little or no impact. Since forecast inputs are likely to change in concert, build a sensitivity analysis that tests multiple changes at a time. Use this analysis to set priorities for strategic actions.

Next, use scenario analysis to deepen the understanding that your valuation provides. Start by determining the key uncertainties that affect the company's future, and use these uncertainties to construct multiple forecasts. Uncertainty can be as simple as wondering whether a particular product launch will be successful. Or it can be complex—not knowing which technology will dominate the market, for example. Construct a comprehensive forecast consistent with each scenario, and weight the resulting equity valuations by their probability of occurring. Scenario analysis will not only guide your valuation range, but also inform your thinking about strategic actions and resource allocation under alternative situations.

VALIDATING THE MODEL

Once you have a workable valuation model, you should perform several checks to test the logic of your results, minimize the possibility of errors, and ensure that you understand the forces driving the valuation. Start by making sure that the model is technically robust—for example, by checking that the balance sheet balances in each forecast year. Second, test whether results are consistent with industry economics. For instance, do key value drivers, such as return on invested capital (ROIC), change in a way that is consistent with the intensity of competition? Next, compare the model's output with the current share price and trading multiples. Can differences be explained by economics, or is an error possible? We address each of these tasks next.

Is the Model Technically Robust?

Ensure that all checks and balances in your model are in place. Your model should reflect the following fundamental equilibrium relationships:

- In the unadjusted financial statements, the balance sheet should balance every year, both historically and in forecast years. Check that net income flows correctly into dividends paid and retained earnings.
- In the rearranged financial statements, check that the sum of invested capital plus nonoperating assets equals the cumulative sources of financing. Is net operating profit less adjusted taxes (NOPLAT) identical when calculated top down from sales and bottom up from net income? Does net income correctly link to dividends and retained earnings in adjusted equity?
- Does the change in excess cash and debt line up with the cash flow statement?

A good model will automatically compute each check as part of the model. A technical change to the model that breaks a check can then be clearly signified. To stress-test the model, change a few key inputs in an extreme manner. For instance, if gross margin is increased to 99 percent or lowered to 1 percent, do the statements still balance?

As a final consistency check, adjust the dividend payout ratio. Since payout will change funding requirements, the company's capital structure will change. Because NOPLAT, invested capital, and free cash flow are independent of capital structure, these values should not change with changes in the payout ratio. If they do, the model has a mechanical flaw.

Is the Model Economically Consistent?

The next step is to check that your results reflect appropriate value driver economics. If the projected returns on invested capital are above the weighted average cost of capital (WACC), the value of operations should be above the book value of invested capital. If, in addition, growth is high, the value of operations should be considerably above book value. If not, a computational error has probably been made. Compare your valuation results with a back-of-the-envelope value estimate based on the key value driver formula, taking long-term average growth and return on invested capital as key inputs.

Make sure that patterns of key financial and operating ratios are consistent with economic logic:

- *Are the patterns intended?* For example, does invested-capital turnover increase over time for sound economic reasons (economies of scale) or simply because you modeled future capital expenditures as a fixed percentage of revenues? Are future cash tax rates changing dramatically because you forecast deferred-tax assets as a percentage of revenues or operating profit?
- *Are the patterns reasonable?* Avoid large step changes in key assumptions from one year to the next, because these will distort key ratios and could lead to false interpretations. For example, a large single-year improvement in capital efficiency could make capital expenditures in that year negative (the sale of fixed equipment for cash is unlikely), leading to an unrealistically high cash flow.
- *Are the patterns consistent with industry dynamics?* In certain cases, reasonable changes in key inputs can lead to unintended consequences. Exhibit 15.1 presents price and cost data for a hypothetical company in a competitive industry. To keep pace with inflation, you forecast the company's prices to increase by 3 percent per year. Because of cost efficiencies, operating costs are expected to drop by 2 percent per year. In isolation, each rate appears innocuous. Computing ROIC reveals a significant trend. Between year 1 and year 10, ROIC grows from 9.3 to 39.2 percent—unlikely in a competitive industry. Since cost advantages are difficult to protect, competitors are likely to mimic production and lower prices to capture share. A good model will highlight this economic inconsistency.
- *Is the company in a steady state by the end of the explicit forecasting period?* Following the explicit forecasting period, when you apply a continuing-value formula, the company's margins, returns on invested capital, and growth should be stable. If this is not the case, extend the explicit forecast period until a steady state is reached.

Are the Results Plausible?

Once you believe the model is technically sound and economically consistent, you should test whether its valuation results are plausible. If the company is listed, compare your results with the market value. If your estimate is far from

EXHIBIT 15.1 **ROIC Impact of Small Changes: Sample Price and Cost Trends**

$

	Year 1	Year 2	Year 3	Year 4	Year 5	...	Year 10	Growth, %
Price	50.0	51.5	53.0	54.6	56.3	...	65.2	3.0
Number of units	100.0	103.0	106.1	109.3	112.6	...	130.5	
Revenue	5,000.0	5,304.5	5,627.5	5,970.3	6,333.9	...	8,512.2	
Cost per unit	43.0	42.1	41.3	40.5	39.7	...	35.9	–2.0
Number of units	100.0	103.0	106.1	109.3	112.6	...	130.5	
Cost	4,300.0	4,340.4	4,381.2	4,422.4	4,464.0	...	4,677.8	
Profit	700.0	964.1	1,246.3	1,547.9	1,869.9	...	3,834.4	
Invested capital	7,500.0	7,725.0	7,956.8	8,195.5	8,441.3	...	9,785.8	
ROIC, %	9.3	12.5	15.7	18.9	22.2	...	39.2	

the market value, do not jump to the conclusion that the market is wrong. Your default assumption should be that the market is right, unless you have specific indications that not all relevant information has been incorporated in the share price—for example, due to a small free float or low liquidity of the stock.

Also perform a sound multiples analysis. Calculate the implied forward-looking valuation multiples of the operating value over, for example, earnings before interest, taxes, and amortization (EBITA). Compare these with equivalently defined multiples of traded peer-group companies. Chapter 16 describes how to do a proper multiples analysis. Make sure you can explain any significant differences with peer-group companies in terms of the companies' value drivers and underlying business characteristics or strategies.

SENSITIVITY ANALYSIS

With a robust model in hand, test how the company's value responds to changes in key inputs. Senior management can use sensitivity analysis to prioritize the actions most likely to affect value materially. From the investor's perspective, sensitivity analysis can focus on which inputs to investigate further and monitor more closely. Sensitivity analysis also helps bound the valuation range when there is uncertainty about the inputs.

Assessing the Impact of Individual Drivers

Start by testing each input one at a time to see which has the largest impact on the company's valuation. Exhibit 15.2 presents a sample sensitivity analysis. Among the alternatives presented, a permanent one-percentage-point reduction in selling expenses has the greatest effect on the company's

EXHIBIT 15.2 **Sample Sensitivity Analysis**

Driver	Change	Valuation impact, $ million
Margin	1 percentage point permanent reduction in selling expense	29
Growth	1 percentage point increase in price each year for next 5 years	26
Growth	1 percentage point increase in volume each year for next 5 years	14
Taxes	1 percentage point reduction in the operating tax rate	11
Capital	5-day reduction in inventory	8

valuation.[1] The analysis will also show which drivers have the least impact on value. Too often, we find our clients focusing on actions that are easy to measure but fail to affect value very much.

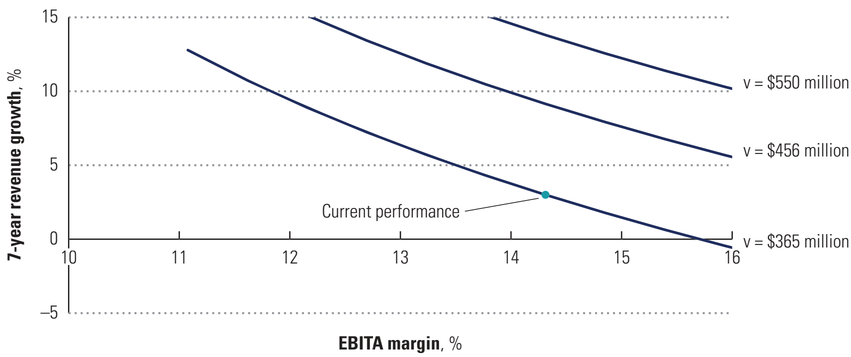
Although an input-by-input sensitivity analysis will increase your knowledge about which inputs drive the valuation, its use is limited. First, inputs rarely change in isolation. For instance, an increase in selling expenses is likely to accompany an increase in revenue growth. Second, when two inputs are changed simultaneously, interactions can cause the combined effect to differ from the sum of the individual effects. Therefore, you cannot compare a one-percentage-point increase in selling expenses with a one-percentage-point increase in growth. If there are interactions in the movements of inputs, the one-by-one analysis would miss them. To capture possible interactions, you need to analyze trade-offs.

Analyzing Trade-Offs

Strategic choices typically involve trade-offs between inputs into your valuation model. For instance, raising prices leads to fewer purchases, lowering inventory results in more missed sales, and entering new markets often affects both growth and margin. Exhibit 15.3 presents an analysis that measures the impact on a valuation when two inputs are changed simultaneously. Based on an EBITA margin of 14 percent and revenue growth of 3 percent (among other forecasts), a hypothetical company is currently valued at $365 million. The curve drawn through this point represents all the possible combinations of EBITA margin and revenue growth that lead to the same valuation. (Economists call this an isocurve.) To increase the valuation by 25 percent, from $365 million to $456 million, the organization needs to move northeast to the

[1]Some analysts test the impact of both positive and negative changes to each driver and then plot the results from largest to smallest variation. Given its shape, the resulting chart is commonly known as a tornado chart.

EXHIBIT 15.3 **Valuation Isocurves by Growth and Margin**



next isocurve. Using this information, management can set performance targets that are consistent with the company's valuation aspirations and competitive environment.

When performing sensitivity analysis, do not limit yourself to changes in financial variables. Check how changes in sector-specific nonfinancial value drivers affect the final valuation. This is where the model's real power lies. For example, if you increase customer churn rates for a telecommunications company, does company value decrease? Can you explain with back-of-the-envelope estimates why the change is so large or small?

CREATING SCENARIOS

Valuation requires a forecast, but the future can take many paths. A government might pass legislation affecting the entire industry. A new discovery could revolutionize a competitor's product portfolio. Since the future is never truly knowable, consider making financial projections under multiple scenarios.[2] The scenarios should reflect different assumptions regarding future macroeconomic, industry, or business developments, as well as the corresponding strategic responses by industry players. Collectively, the scenarios should capture the future states of the world that would have the most impact on value creation over time and a reasonable chance of occurrence. Assess how likely it is that the key assumptions underlying each scenario will change, and assign to each scenario a probability of occurrence.

[2]Overconfidence is a well-known behavioral bias. Embracing uncertainty through the use of scenario analysis helps mitigate overconfidence. For more on overconfidence and valuation, see J. Lambert, V. Bessiere, and G. N'Goala, "Does Expertise Influence the Impact of Overconfidence on Judgment, Valuation and Investment Decision?" *Journal of Economic Psychology* 33, no. 6 (December 2012): 1115–1128.

When analyzing the scenarios, critically review your assumptions concerning the following variables:

- *Broad economic conditions:* How critical are these forecasts to the results? Some industries are more dependent on basic economic conditions than others are. Home building, for example, is highly correlated with the overall health of the economy. Branded food processing, in contrast, is less so.
- *Competitive structure of the industry:* A scenario that assumes substantial increases in market share is less likely in a highly competitive and concentrated market than in an industry with fragmented and inefficient competition.
- *Internal capabilities of the company:* Focus on capabilities that are necessary to achieve the business results predicted in the scenario. Can the company develop its products on time and manufacture them within the expected range of costs?
- *Financing capabilities of the company:* Financing capabilities are often implicit in the valuation. If debt or excess marketable securities are excessive relative to the company's targets, how will the company resolve the imbalance? Should the company raise equity if too much debt is projected? Should the company be willing to raise equity at its current market price?

Complete the alternative scenarios suggested by the preceding analyses. The process of examining initial results may well uncover unanticipated questions that are best resolved by creating additional scenarios. In this way, the valuation process is inherently circular. Performing a valuation often provides insights that lead to additional scenarios and analyses.

Exhibits 15.4 and 15.5 provide a simplified example of a scenario approach to discounted-cash-flow (DCF) valuation. The company being valued faces great uncertainty because of a new-product launch for which it has spent considerable time and money on research and development (think of a cosmetics company launching a new electric skin care brush, such as Pacific Bioscience's Clarisonic[3]). If the new product is a top seller, revenue growth will more than double over the next few years. Returns on invested capital will peak at above 20 percent and remain above 12 percent in perpetuity. If the product launch fails, however, growth will continue to erode as the company's current products become obsolete. Lower average selling prices will cause operating margins to fall. The company's returns on invested capital will decline to levels below the cost of capital, and the company will struggle to earn its cost of capital in the long term. Exhibit 15.4 presents forecasts on growth, operating

[3]Now owned by L'Oréal.

EXHIBIT 15.4 **Key Value Drivers by Scenario**

%

		Financial forecasts							
	2014A	2015	2016	2017	2018	2019	2020	Continuing value	Scenario assessment
Scenario 1									
Revenue growth	5.0	12.0	15.0	14.0	12.0	10.0	5.0	3.5	New product introduction leads to a spike in revenue growth.
After-tax operating margin	7.5	9.0	11.0	14.0	14.0	12.0	10.0	8.0	Margins improve to best in class as consumers pay a price premium for the product.
× Capital turnover, times	1.5	1.4	1.3	1.4	1.5	1.6	1.6	1.6	Capital turnover drops slightly during the product launch as the company builds inventory to meet expected demand.
Return on invested capital	11.3	12.6	14.3	19.6	21.0	19.2	16.0	12.8	
Scenario 2									
Revenue growth	5.0	3.0	(1.0)	(1.0)	1.5	1.5	1.5	1.5	Revenue growth drops as competitors steal share.
After-tax operating margin	7.5	7.0	6.5	6.0	5.5	5.5	6.5	6.5	Lower prices put pressure on margins; cost reductions cannot keep pace.
× Capital turnover, times	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	Capital efficiency falls as price pressure reduces revenue. Inventory reductions mitigate fall.
Return on invested capital	11.3	9.8	9.1	8.4	7.2	7.2	8.5	8.5	

EXHIBIT 15.5 **Example of a Scenario Approach to DCF Valuation**

$ million

Probability-weighted equity value: 1,954

67% probability

Scenario 1		**Description**
Value of operations	5,044	The company's new product launch reinvigorates revenue growth. Higher average selling prices lead to increased operating margins and consequently higher ROICs. ROICs decay as the new product matures, but future offerings keep ROIC above the cost of capital.
Nonoperating assets	672	
Enterprise value	5,716	
Interest-bearing debt	(2,800)	
Equity value	2,916	

33% probability

Scenario 2		**Description**
Value of operations	1,993	The company launches a new product, but the product is seen as inferior to other offerings. Revenue growth remains stagnant and even declines as prices erode and the company loses share. Returns on capital eventually rise to the cost of capital as management refocuses on cost reduction.
Nonoperating assets	276	
Enterprise value	2,269	
Interest-bearing debt	(2,269)	
Equity value	–	

margin, and capital efficiency that are consistent with each of these two scenarios.

Next, build a separate free cash flow model for each set of forecasts. Although not presented here, the resulting cash flow models are based on the DCF methodology outlined in Chapter 8. Exhibit 15.5 presents the valuation results. In the case of a successful product launch, the DCF value of operations equals $5,044 million. The nonoperating assets consist primarily of nonconsolidated subsidiaries, and given their own reliance on the product launch, they are valued at the implied NOPLAT multiple for the parent company, $672 million. A comprehensive scenario will examine all items, including nonoperating items, to make sure they are consistent with the scenario's underlying premise. Next, deduct the face value of the debt outstanding at $2,800 million (assuming interest rates have not changed, so the market value of debt equals the face value). The resulting equity value is $2,916 million.

If the product launch fails, the DCF value of operations is only $1,993 million. In this scenario, the value of the subsidiaries is much lower ($276 million), as their business outlook has deteriorated due to the failure of the new product. The value of the debt is no longer $2,800 million in this scenario. Instead, the debt holders would end up with $2,269 million by seizing the enterprise. In scenario 2, the common equity would have no value.

Given the approximately two-thirds probability of success for the product, the probability-weighted equity value across both scenarios amounts to $1,954 million. Since estimates of scenario probabilities are likely to be rough at best, determine the range of probabilities that point to a particular strategic action. For instance, if this company were an acquisition target available for $1.5 billion, any probability of a successful launch above 50 percent would lead to value creation. Whether the probability is 67 percent or 72 percent does not affect the decision outcome.

When using the scenario approach, make sure to generate a complete valuation buildup from value of operations to equity value. Do not shortcut the process by deducting the face value of debt from the scenario-weighted value of operations. Doing this would seriously underestimate the equity value, because the value of debt is different in each scenario. In this case, the equity value would be undervalued by $175 million ($2,800 million face value minus $2,625 million probability-weighted value of debt).[4] A similar argument holds for nonoperating assets.

Creating scenarios also helps you understand the company's key priorities. In our example, reducing costs or cutting capital expenditures in the downside scenario will not meaningfully affect value. Any improvements in the downside scenario whose value is less than $531 million ($2,800 million in face value less $2,269 million in market value) will accrue primarily to the debt holders. In contrast, increasing the odds of a successful launch has a much greater impact on shareholder value. Increasing the success probability from two-thirds to three-fourths would boost shareholder value by more than 10 percent.

THE ART OF VALUATION

Valuation can be highly sensitive to small changes in assumptions about the future. Take a look at the sensitivity of a typical company with a forward-looking price-to-earnings ratio of 15 to 16. Increasing the cost of capital for this company by half a percentage point will decrease the value by approximately 10 percent. Changing the growth rate for the next 15 years by one percentage point annually will change the value by about 6 percent. For high-growth companies, the sensitivity is even greater. In light of this sensitivity, it shouldn't be surprising that the market value of a company fluctuates over time. Historical volatilities for a typical stock over the past several years have been around 25 percent per annum. Taking this as an estimate for future volatility, the market value of a typical company could well fluctuate around its expected value by 15 percent over the next month.[5]

We typically aim for a valuation range of plus or minus 15 percent, which is similar to the range used by many investment bankers. Even valuation professionals cannot always generate exact estimates. In other words, keep your aspirations for precision in check.

[4]This also explains why using the market price of bonds or debt in your valuation can lead to errors if the bonds trade at a significant discount to their face value due to default risk (see Chapter 14's discussion of the treatment of debt as a nonequity claim). Deducting the market price of such bonds from the probability-weighted value of operations would be correct only if your assumptions on default scenarios and probabilities were to reflect precisely those of bond investors in the capital market.

[5]Based on a 95 percent confidence interval for the end-of-month price of a stock with an expected return of 9 percent per year.

16

Using Multiples

While discounted cash flow (DCF) is the most accurate and flexible method for valuing companies, using a relative valuation approach, such as juxtaposing the earnings multiples of comparable companies, can provide insights and help you summarize and test your valuation. In practice, however, multiples are often used in a superficial way that leads to erroneous conclusions. This chapter explains how to use multiples correctly. Most of the focus will be on earnings multiples, the most commonly used variety. At the end, we'll also touch on some other multiples.

The basic idea behind using multiples for valuation is that similar assets should sell for similar prices, whether they are houses or shares of stock. In the case of a share of stock, the typical benchmark is some measure of earnings, most popularly the price-to-earnings (P/E) multiple, which is simply the value of the company divided by its earnings. Multiples can be used to value nontraded companies or divisions of traded companies and to see how a listed company is valued relative to peers. Companies in the same industry and with similar performance should trade at the same multiple. Exhibit 16.1 is a disguised example of a multiples table for several packaged-foods companies.

The exhibit illustrates what happens if you don't go deep enough in your multiples analysis. The managers of Company A looked only at the companies' P/Es and were concerned that their company was trading at a P/E of 7.3 times, while most of their peers were trading at a P/E of about 14, a discount of 50 percent. The management team believed the market just didn't understand its strategy or performance. In fact, management didn't understand the math of multiples. If the managers had looked at the other multiple shown in the exhibit—enterprise value to earnings before interest, taxes, and amortization (EV/EBITA)—they would have seen that the company was trading right in line with its peers. The reason for the difference was that Company A had much more debt relative to equity than the other companies. We estimated that if the company had had the same relative debt as its peers, its P/E would

EXHIBIT 16.1 **Multiples for Packaged-Foods Companies**

$ billion

Company	Market value of equity	Enterprise value (equity + debt)	Net income (1 year forward)	EBITA (1 year forward)	Multiples: Price/earnings	Multiples: Enterprise value/EBITA
A	2,783	9,940	381	929	7.3	10.7
B	13,186	16,279	856	1,428	15.4	11.4
C	8,973	11,217	665	1,089	13.5	10.3
D	14,851	22,501	1,053	2,009	14.1	11.2
Mean					12.6	10.9
Median					13.8	11.0
Mean (excluding A)					14.3	11.0
Median (excluding A)					14.1	11.2

also have been 14. The difference was pure mathematics, not a judgment on the part of investors. Except for very high growth companies, a company with higher debt relative to peers will have a lower P/E ratio because more debt translates to higher risk for shareholders and a higher cost of equity. Therefore, each dollar of earnings (and cash flow to shareholders) will be worth less to an investor.[1]

To use earnings multiples properly, you have to dig into the accounting statements to make sure you are comparing companies on an apples-to-apples basis. You also have to choose the right companies to compare. Keep in mind these five principles for correctly using earnings multiples:

1. *Value multibusiness companies as a sum of their parts.* Even companies that appear to be in a single industry will often compete in subindustries or product areas with widely varying return on invested capital (ROIC) and growth, leading to substantial variations in multiples.
2. *Use forward estimates of earnings.* Multiples using forward earnings estimates typically have much lower variation across peers, leading to a narrower range of uncertainty of value. They also embed future expectations better than multiples based on historical data.
3. *Use the right multiple, usually net enterprise value to EBITA or net enterprise value to NOPLAT.* Although the P/E is widely used, it is distorted by capital structure and nonoperating gains and losses.

[1] The P/E multiple is a function of return on capital, cost of capital, and growth. For very high growth companies, whose enterprise multiples are greater than the multiple for debt, the multiple will actually increase with leverage.

4. *Adjust the multiple for nonoperating items.* Nonoperating items embedded in reported EBITA, as well as balance sheet items like excess cash and pension items, can lead to large distortions of multiples.
5. *Use the right peer group, not a broad industry average.* A good peer group must not only operate in the same industry, but also have similar prospects for ROIC and growth.

Follow these guidelines and you'll typically find that, on a relative basis, a company is valued in line with similarly performing peers.

VALUE MULTIBUSINESS COMPANIES AS A SUM OF THEIR PARTS

Most large companies, even if they operate in a single industry, will have business units in subindustries with different competitive dynamics, leading to large differences in ROIC and growth. Each of those units will have different valuation multiples. To value these companies using multiples, use a sum-of-parts approach, valuing each business unit with a multiple appropriate to its peers and performance.

Johnson & Johnson is classified by many as a health-care company, but its three major units (pharmaceuticals, medical devices, and consumer health products) have widely varying economic characteristics. While all three businesses have high returns on capital, in recent years investors have been skeptical of the ability of pharmaceutical companies to generate enough new products to replace those going off patent, so pharmaceutical companies tend to have modest multiples. Investors are more confident that consumer health-care companies can ride consumer brand loyalty to sustain performance over the long term, leading to higher multiples than for pharmaceutical companies.

Even businesses that are even more narrowly focused often have different subunit economics. For example, oil and gas services companies provide oil and gas companies with equipment and services that might include bottom hole assemblies, drill pipes, pressure-control services, intervention services, pressure pumping, fluid handling, subsea construction, and even temporary housing for workers. In 2014, some of these product areas, including bottom hole assemblies and drill pipes, earned much higher returns on capital than pressure-control services and intervention services. Ideally, you would value units by using as fine-grained an approach as possible, comparing them with companies that have similar units and economics.

For an example of a good sum-of-parts valuation, see Exhibit 16.2. For each unit of this disguised company, we apply a different multiple to its earnings based on different peers, and then sum the values of the units to estimate net

EXHIBIT 16.2 **Sample Sum-of-Parts Valuation**

	2014 NOPLAT, $ million	EV/NOPLAT, times		Value, $ million	
		High	Low	High	Low
Business unit 1	410	16.0	14.5	6,568	5,952
Business unit 2	299	13.9	12.5	4,165	3,749
Business unit 3	504	13.1	12.5	6,597	6,306
Business unit 4	587	9.7	9.4	5,681	5,533
Business unit 5	596	9.0	8.0	5,365	4,769
Business unit 6	116	8.0	7.0	931	814
Corporate	(542)	8.0	9.1	(4,339)	(4,917)
Net enterprise value	1,971	12.7	11.3	24,968	22,207

	2013 Posttax net income, $ million	Book value, $ million	2013 earnings multiple, times	Market value/ book value, times	Value, $ million High	Value, $ million Low
Joint ventures	157	675	12.0	2.5	1,879	1,688
Other investments		1,525			1,525	1,525
Cash and marketable securities		2,879			2,879	2,879
Gross enterprise value					31,251	28,298
Debt		(10,776)			(10,776)	(10,776)
Unfunded retirement liabilities		(2,907)			(2,907)	(2,907)
Noncontrolling interest	(45)	(296)	12.0	2.5	(540)	(739)
Other		(1,940)			(1,940)	(1,940)
Equity value					15,088	11,937
Shares outstanding, million					500	500
Equity value per share					$30.18	$23.87

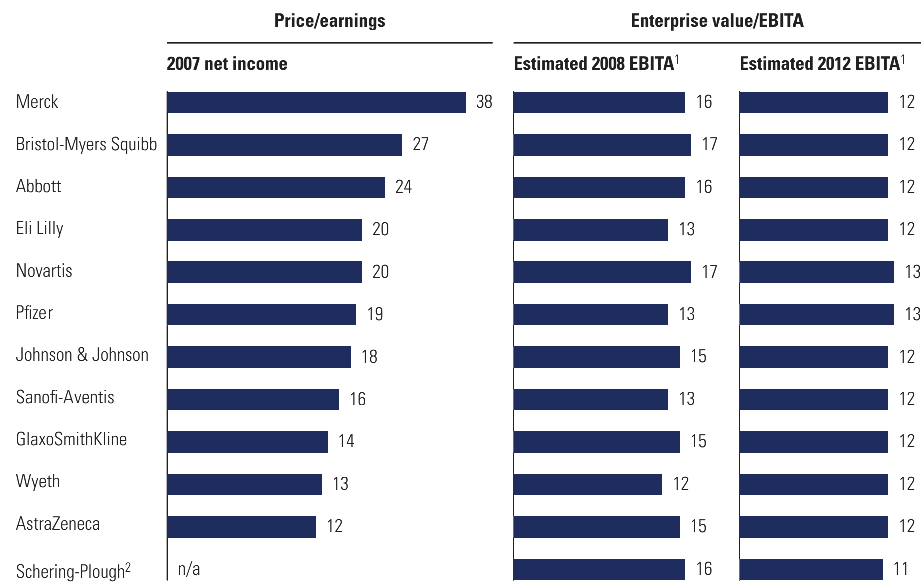
enterprise value. To estimate equity value, we add nonoperating assets and subtract debt and debt equivalents.

Note that the business unit multiples range from the midteens to below 10. Without the sum-of-parts approach, it would be impossible to value this company accurately. We also used ranges for the value of each unit, reflecting the imprecision of valuing any business based on the valuation of peers at a single point in time.

USE FORWARD EARNINGS ESTIMATES

When you are building multiples, the denominator should be a forecast of profits, preferably normalized for unusual items, rather than historical profits. Unlike backward-looking multiples, forward-looking multiples are consistent with the principles of valuation—in particular, that a company's value equals the present value of future cash flows, not sunk costs. Normalized earnings estimates better reflect long-term cash flows by avoiding one-time items. For example, Warren Buffett and other disciples of value-investing guru Benjamin

EXHIBIT 16.3 **Pharmaceuticals: Backward- and Forward-Looking Multiples, December 2007**



[1] Consensus analyst forecast.
[2] Schering-Plough reported a loss in 2007 due to a large write-off of in-process R&D related to a recent acquisition.

Graham don't use reported earnings. Rather, they rely on a sustainable level of earnings that they refer to as "earnings power."[2]

Forward-looking multiples generally also have much lower variation across peer companies. We came across a particularly striking example of this in the pharmaceutical industry in 2007. The backward-looking P/Es ranged from 12 to 38 times (Exhibit 16.3). The ratio of enterprise value to the next year's projected EBITA also showed significant variation, ranging from 12 to 17 times. But when we extended the forecast window to five years, the variation across companies all but disappeared.

The convergence of multiples four years out in the pharmaceuticals industry is extreme. This is most likely due to the market's ability to project near-term earnings well, because drug introductions and patent expirations are well known. By contrast, it is difficult to differentiate long-term success across companies because it depends on an individual company's ability to discover or develop new drugs. No one has figured out a good way to do that.

Empirical evidence shows that forward-looking multiples are indeed more accurate predictors of value than historical multiples are. One empirical study examined the characteristics and performance of historical multiples versus

[2] B. C. N. Greenwald, J. Kahn, P. D. Sonkin, and M. van Biema, *Value Investing: From Graham to Buffett and Beyond* (Hoboken, NJ: John Wiley & Sons, 2001).

forward industry multiples for a large sample of companies trading on U.S. exchanges.[3] When multiples for individual companies were compared with their industry multiples, their historical earnings-to-price (E/P) ratios had 1.6 times the standard deviation of one-year-forward E/P ratios (6.0 percent versus 3.7 percent). Other research, which used multiples to predict the prices of 142 initial public offerings, also found that multiples based on forecast earnings outperformed those based on historical earnings.[4] As the analysis moved from multiples based on historical earnings to multiples based on one- and two-year forecasts, the average pricing error fell from 55.0 percent to 43.7 percent to 28.5 percent, respectively, and the percentage of firms valued within 15 percent of their actual trading multiple increased from 15.4 percent to 18.9 percent to 36.4 percent.

To build a forward-looking multiple, choose a forecast year for EBITA that best represents the long-term prospects of the business. In periods of stable growth and profitability, next year's estimate will suffice. For companies generating extraordinary earnings (either too high or too low) or for companies whose performance is expected to change, use projections further out.

USE NET ENTERPRISE VALUE DIVIDED BY ADJUSTED EBITA OR NOPLAT

Most financial websites and newspapers quote a price-to-earnings ratio by dividing a company's share price by the prior 12 months' GAAP-reported earnings per share. Yet these days, sophisticated investors and bankers use what we call forward-looking multiples of net enterprise value to EBITA (or NOPLAT). They find that these multiples provide a more apples-to-apples comparison of company values.

The reasons for using forward earnings are the same as the ones discussed in the previous section. Using enterprise value to EBITA (or NOPLAT) rather than a P/E eliminates the distorting effect of different capital structures, nonoperating assets, and nonoperating income statement items (such as the nonoperating portion of pension expense). Any item that isn't a helpful indicator of a company's future cash-generating ability should be excluded from your calculation of the multiple. For example, one-time gains or losses and nonoperating expenses, such as the amortization of intangibles, have no direct relevance to future cash flows; including them in the multiple would distort comparisons with other companies.

Sometimes analysts use an alternative multiple: enterprise value to earnings before interest, taxes, depreciation, and amortization (EBITDA). Later in

[3] J. Liu, D. Nissim, and J. Thomas, "Equity Valuation Using Multiples," *Journal of Accounting Research* 40 (2002): 135–172.
[4] M. Kim and J. R. Ritter, "Valuing IPOs," *Journal of Financial Economics* 53, no. 3 (1999): 409–437.

EXHIBIT 16.4 **P/E Multiple Distorted by Capital Structure**

$ million

	Company A	Company B	Company C	Company D
Income statement				
EBITA	100	100	100	100
Interest expense	–	(20)	–	(25)
Earnings before taxes	100	80	100	75
Taxes	(40)	(32)	(40)	(30)
Net income	60	48	60	45
Market values				
Debt	–	400	–	500
Equity	1,000	600	2,500	2,000
Enterprise value (EV)	1,000	1,000	2,500	2,500
Multiples, times				
EV/EBITA	10.0	10.0	25.0	25.0
Price/earnings	16.7	12.5	41.7	44.4

this section, we'll explain the logic of using EBITA or NOPLAT instead of EBITDA.

Why Not Price to Earnings?

This book has focused throughout on the drivers of operating performance—ROIC, growth, and free cash flow—because the traditional metrics, such as return on assets (ROA) and return on equity (ROE), mix the effects of operations and capital structure. The same logic holds for multiples. Since the price-to-earnings ratio mixes capital structure and nonoperating items with expectations of operating performance, a comparison of P/Es is a less reliable guide to companies' relative value than a comparison of enterprise value (EV) to EBITA or NOPLAT.

To show how capital structure distorts the P/E, Exhibit 16.4 presents financial data for four companies, named A through D. Companies A and B trade at 10 times enterprise value to EBITA, and Companies C and D trade at 25 times enterprise value to EBITA. In each pair, the companies have different P/Es. Companies A and B differ only in how their business is financed, not in their operating performance. The same is true for Companies C and D.

Since Companies A and B trade at typical enterprise value multiples, the P/E drops for the company with higher leverage. This is because the EV-to-EBITA ratio ($1,000 million/$100 million = 10 times) is lower than the ratio of debt value to interest expense ($400 million/$20 million = 20 times). Since the blend of debt at 20 times and pretax equity must equal the enterprise value at 10 times, the pretax equity multiple must drop below 10 times to offset the greater weight placed on high-multiple debt.[5] The opposite is true when enterprise value to EBITA exceeds the ratio of debt to interest expense (less common, given today's low interest rates). Company D has a higher P/E than Company C because Company D uses more leverage than Company C. In this case, a high pretax P/E (greater than 25 times) must be blended with the debt multiple (20 times) to generate an EV-to-EBITA multiple of 25 times.

Why Not EV to EBIT?

It's clear that shifting to net-enterprise-value multiples provides better insights and comparisons across peer companies. The next question is what measure of operating profits to use in the denominator—EBIT, EBITDA, EBITA (adjusted), or NOPLAT? We recommend EBITA or NOPLAT.

The difference between EBIT and EBITA is amortization of intangible assets. Most often, the bulk of amortization is related to acquired intangible assets, such as customer lists or brand names. Chapter 9 explained why we exclude amortization of intangibles from the calculation of ROIC and free cash flow. It is noncash, and, unlike depreciation of physical assets, the replacement of intangible assets is already incorporated in EBITA through line items such as marketing and selling expenses. So using EBITA is preferred, both from a logical perspective and because it leads to more comparable multiples across peers.

To illustrate the distortion caused by amortization of acquired intangible assets, we compare two companies with the same size and underlying operating profitability. The difference is that Company A achieved its current size by acquiring Company B whereas Company C grew organically. Exhibit 16.5 compares these companies before and after A's acquisition of B.

Concerned that its smaller size might lead to a competitive disadvantage, Company A purchased Company B. Assuming no synergies, the combined financial statements of Companies A and B are identical to Company C's with two exceptions: acquired intangibles and amortization. Acquired intangibles are recognized when a company is purchased for more than its book value.

[5] Appendix D derives the explicit relationship between a company's actual P/E and its unlevered P/E (PE_u)—the P/E as if the company were entirely financed with equity. Assuming no taxes, a company's P/E can be expressed as follows:

$$\frac{P}{E} = 1/k_d + \frac{1/k_d - PE_u}{\left(\frac{D}{V}\right)(k_a)(PE_u) - 1}$$

where k_d is the cost of debt and D/V is the ratio of debt to value. For companies with large unlevered P/Es (i.e., companies with significant opportunities for future value creation), P/E systematically increases with leverage. Conversely, companies with small unlevered P/Es would exhibit a drop in P/E as leverage rises.

EXHIBIT 16.5 **Enterprise-Value-to-EBIT Multiple Distorted by Acquisition Accounting**

$ million

	Before acquisition			After A acquires B	
	Company A	Company B	Company C	Company A + B	Company C
EBIT					
Revenues	375	125	500	500	500
Cost of sales	(150)	(50)	(200)	(200)	(200)
Depreciation	(75)	(25)	(100)	(100)	(100)
EBITA	150	50	200	200	200
Amortization	–	–	–	(75)	–
EBIT	150	50	200	125	200
Invested capital					
Organic capital	750	250	1,000	1,000	1,000
Acquired intangibles	–	–	–	750	–
Invested capital	750	250	1,000	1,750	1,000
Enterprise value	1,500	500	2,000	2,000	2,000
Multiples, times					
EV/EBITA	10.0	10.0	10.0	10.0	10.0
EV/EBIT	10.0	10.0	10.0	16.0	10.0

In this case, Company A purchased Company B for $1,000 million, which is $750 million greater than its book value. If these acquired intangibles are separable and identifiable, such as patents, Company A + B must amortize them over the estimated life of the asset. Assuming an asset life of 10 years, Company A + B will record $75 million in amortization each year.

At the bottom of Exhibit 16.5, we show enterprise value multiples using EBITA and EBIT, both before and after the acquisition. Since all three companies generated the same level of operating performance, they traded at identical multiples before the acquisition, 10 times EBIT (and EBITA). After the acquisition, the combined Company A + B should continue to trade at a multiple of 10 times EBITA, because its performance is identical to that of Company C. However, amortization expense causes EBIT to drop for the combined company, so its EV-to-EBIT multiple increases to 16 times. This rise in the multiple does not reflect a premium, however (remember, no synergies were created). It is merely an accounting artifact. Companies that acquire other companies must recognize amortization, whereas companies that grow organically have none to recognize. To avoid forming a distorted picture of their relative operating performance, use EV-to-EBITA multiples.

In limited cases, companies will capitalize organic investments in intangible assets, just as UPS capitalized its software development costs (Chapter 9), and then amortize them over their useful life. In these cases, you should separate organic amortization from acquisition amortization and add back the acquisition amortization to EBIT to compute an adjusted EBITA.

EXHIBIT 16.6 **Enterprise-Value-to-EBITDA Multiple Distorted by Capital Investment**

$ million

	Company A	Company B
Income statement		
Revenues	1,000	1,000
Raw materials	(100)	(250)
Operating costs	(400)	(400)
EBITDA	500	350
Depreciation	(200)	(50)
EBITA	300	300
Operating taxes	(90)	(90)
NOPLAT	210	210
Multiples, times		
EV/EBITA	10.0	10.0
EV/EBITDA	6.0	8.6

	Company A	Company B
Free cash flow		
NOPLAT	210	210
Depreciation	200	50
Gross cash flow	410	260
Investment in working capital	(60)	(60)
Capital expenditures	(200)	(50)
Free cash flow	150	150
Enterprise value	3,000	3,000

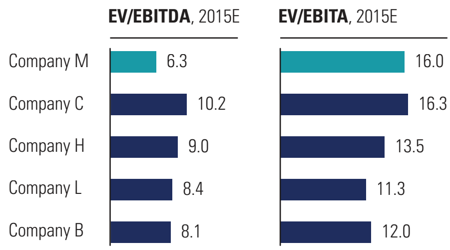
Choosing between EBITA and EBITDA

A common alternative to the EBITA multiple is the EBITDA multiple. Many practitioners use EBITDA multiples because depreciation is, strictly speaking, a noncash expense, reflecting sunk costs, not future investment. This logic, however, does not apply uniformly. For many industries, depreciation of existing assets is the accounting equivalent of setting aside the future capital expenditure that will be required to replace the assets. Subtracting depreciation from the earnings of such companies therefore better represents future cash flow and consequently the company's valuation.

To see this, consider two companies that differ in only one aspect: in-house versus outsourced production. Company A manufactures its products using its own equipment, whereas Company B outsources manufacturing to a supplier. Exhibit 16.6 provides financial data for each company. Since Company A owns its equipment, it recognizes significant annual depreciation—in this case, $200 million. Company B has less equipment, so its depreciation is only $50 million. However, Company B's supplier will include its own depreciation costs in its price, and Company B will consequently pay more for its raw materials. Because of this difference, Company B generates EBITDA of only $350 million, versus $500 million for Company A. This difference in EBITDA will lead to differing multiples: 6.0 times for Company A versus 8.6 times for Company B. Does this mean Company B trades at a valuation premium? No, when Company A's depreciation is deducted from its earnings, both companies trade at 10.0 times EBITA.

When computing the EV-to-EBITDA multiple in the previous example, we failed to recognize that Company A (the company that owns its equipment) will have to expend cash to replace aging equipment: $200 million for

EXHIBIT 16.7 **Company M Peer Multiples Comparison**



Company A versus $50 million for Company B. Since capital expenditures are recorded in free cash flow and not NOPLAT, the EBITDA multiple is distorted.

We came across an interesting example in a processing industry, as shown in Exhibit 16.7. On an EV-to-EBITDA basis, Company M trades at a multiple of 6.3 times, far below its peers' multiples of 8.1 to 10.2 times. However, on an EV-to-EBITA basis, it trades at the high end of its peers. In this industry, companies have to replace depreciated assets constantly. In Company H's case, its low cash margins also contribute to the larger gap between EBITA and EBITDA.

In some situations, EBITDA scales a company's valuation better than EBITA. These occur when current depreciation is not an accurate predictor of future capital expenditures. For instance, consider two companies, each of which owns a machine that produces identical products. Both machines have the same cash-based operating costs, and each company's products sell for the same price. If one company paid more for its equipment (for whatever reason—perhaps poor negotiation), it will have higher depreciation and, thus, lower EBITA. Valuation, however, is based on future discounted cash flow, not past profits. And since both companies have identical cash flow, they should have identical values.[6] We would therefore expect the two companies to have identical multiples. Yet, because EBITA differs across the two companies, their multiples will differ as well.

NOPLAT vs. EBITA

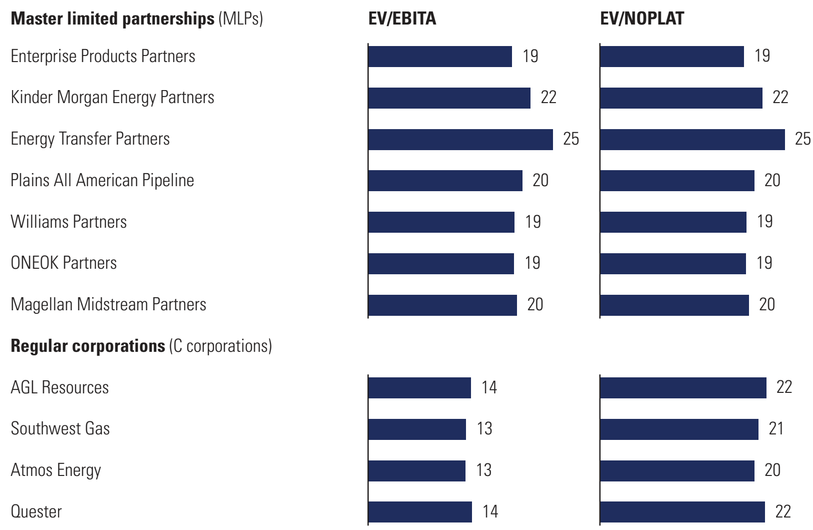
Analysts and investors often use enterprise value to EBITA instead of NOPLAT because there is no need to figure out the operating taxes on EBITA.[7] We often

[6]Since depreciation is tax deductible, a company with higher depreciation will have a smaller tax burden. Lower taxes lead to higher cash flows and a higher valuation. Therefore, even companies with identical EBITDAs will have different EBITDA multiples. The distortion, however, is less pronounced.

[7]Reported taxes are not usually a good predictor of operating taxes, because they include nonoperating items. Therefore, most analysts ignore taxes altogether. If time permits, we believe multiples based on NOPLAT provide a better comparison, especially when taxes vary across companies in a predictable way.

EXHIBIT 16.8 **Enterprise Value to NOPLAT vs. Enterprise Value to EBITA**

U.S. pipeline companies, June 2013



use EBITA because it's common practice and works well when all the companies in the peer group have the same operating tax rate, as when they all operate within a single tax jurisdiction. However, when tax rates are different, NOPLAT is a better measure to use.

An extreme but powerful example is U.S. oil and gas pipeline companies. Some pipeline companies are organized as master limited partnerships (MLPs), while others are organized as regular corporations (called C corporations in the U.S. tax code). MLPs do not pay any corporate income taxes; investors pay taxes on their share of the profits. Regular corporations currently pay a 35 percent tax rate in the United States, and investors are taxed again when profits are distributed. Thus, MLPs eliminate an entire layer of taxation. Since the tax differences represent real cash flows, they can't be ignored. Exhibit 16.8 shows that the stock market does take into account these tax differences when valuing companies in these industries. The companies at the top of the exhibit are MLPs, and those at the bottom are regular corporations. Note that NOPLAT multiples across all the companies are in a narrow range of 19 to 22 times (excluding one outlier). The EBITA multiples, however, show a clear delineation between the regular corporations and the MLPs. The EBITA multiples for the MLPs remain the same at 19 to 22 times. For regular corporations, they drop to 13 to 14 times. Clearly, the NOPLAT multiples are superior in this case.[8]

[8]You might ask why all oil and gas pipelines aren't organized as MLPs, given their tax advantages. The tax laws are complex and make it expensive to convert existing C corporations to MLPs. Hence, newer pipelines are typically in MLPs, but not older ones.

Corporate tax rates vary widely from country to country. For example, the Irish corporate tax rate is one of the lowest at 12.5 percent, while the U.S. tax rate is one of the highest at 35 percent. So companies in the same industry with a different geographic mix of operations can have different tax rates that must be factored into their valuation. If the tax rates are different across peers, use net enterprise value to NOPLAT rather than net enterprise value to EBITA.

ADJUST FOR NONOPERATING ITEMS

In a recent presentation to a group of professional investors, we provided the audience with financial data on two companies. We then asked the audience which company traded at a higher EV multiple. The results were surprising. Upon polling the group, we discovered there was no common agreement on how to compute the EV multiple. A group of 100 professionals generated nearly a dozen different comparisons. Further investigation revealed that inconsistencies in how to define enterprise value were the primary cause of this divergence.

Only one approach to building an EV-to-EBITA multiple is theoretically consistent. Enterprise value must include all investor capital but *only* the portion of value attributable to assets that generate (adjusted) EBITA; that's why we often refer to it as "net" enterprise value (net of nonoperating assets). Including value in the numerator, such as the value of joint ventures, without including its corresponding income in the denominator will systematically distort the multiple upward. Conversely, failing to recognize a source of investor capital, such as a noncontrolling interest, will understate the numerator, biasing the multiple downward.

A stark example of a potentially misleading multiple is Apple. At the end of September 2014, Apple had $155 billion of cash and marketable securities. With total debt of $35 billion and equity of $590 billion, it had a gross enterprise value of $625 billion. Subtracting nonoperating cash gives a net enterprise value of $470 billion. With expected EBITA of $64 billion, its gross enterprise value to EBITA would be 9.8 times, while its net enterprise value to EBITA would be 7.3 times, or 26 percent lower.[9]

A way to think about the difference is to think of Apple as a portfolio with two components: one is an operating business that makes consumer electronics, and the other is a pile of cash. The operating business is valued at 7.3 times EBITA, while if the cash earned 1.5 percent pretax, it would be valued at 67 times (the inverse of the earnings yield). The company as a whole is valued at the weighted average of the two multiples, 9.8 times. Since the 9.8 times is a

[9]Even if we adjusted EBITA to include income on the cash (say 1 percent after tax), its gross enterprise value multiple would have been roughly the same.

EXHIBIT 16.9 **Enterprise Value Multiples and Complex Ownership**

$ million

	Company A	Company B	Company C
Partial income statement			
EBITA	100	100	100
Interest income	–	4	–
Interest expense	(18)	(18)	(18)
Earnings before taxes	82	86	82
Gross enterprise value			
Value of core operations	900	900	900
Excess cash	–	100	–
Nonconsolidated subsidiaries	–	200	–
Gross enterprise value	900	1,200	900
Debt	300	300	300
Noncontrolling interest	–	–	100
Market value of equity	600	900	500
Gross enterprise value	900	1,200	900
Multiples, times			
Net EV/EBITA	9.0	9.0	9.0
Debt plus equity minus cash/EBITA	9.0	11.0	9.0
Debt plus equity/EBITA	9.0	12.0	8.0

weighted average of two very different numbers, it doesn't provide any insight into how to think about Apple's value. For example, it would never make sense to compare the 9.8 multiple with the multiples of other consumer electronics companies.

To see how the math provides additional clarity, Exhibit 16.9 presents three companies—A, B, and C—with identical EV-to-EBITA multiples. Company A holds only core operating assets and is financed by traditional debt and equity. Its combined market value of debt and equity equals $900 million. Dividing $900 million by $100 million in EBITA leads to an EV multiple of 9 times.

Company B operates a similar business to Company A but also owns $100 million in excess cash and a minority stake in a nonconsolidated subsidiary, valued at $200 million. Since excess cash and nonconsolidated subsidiaries do not contribute to EBITA, do not include them in the numerator of an EV-to-EBITA multiple. To compute a net enterprise value consistent with EBITA, sum the market value of debt and equity ($1,200 million), and subtract the market value of nonoperating assets ($300 million).[10] Divide the resulting net enterprise value ($900 million) by EBITA ($100 million). The result is an EV-to-EBITA multiple of 9, which matches that of Company A. Failing to subtract the

[10] Alternatively, we could adjust the denominator rather than the numerator by adding interest income to EBITA. This definition of EV to EBITA is consistent but is biased upward. This is because the multiple for excess cash typically exceeds that of core operations. The greater the proportion of cash to overall value, the higher the resulting multiple.

market value of nonoperating assets will lead to a multiple that is too high. For instance, if you divide debt plus equity by EBITA for Company B, the resulting multiple is 12 times, three points higher than the correct value.

Similar adjustments are necessary for financial claims other than debt and equity. To calculate enterprise value consistently with EBITA, you must include the market value of all financial claims, not just debt and equity. For Company C, outside investors hold a noncontrolling interest in a consolidated subsidiary. Since the noncontrolling stake's value is supported by EBITA, you must include it in the enterprise value calculation. Otherwise, the EV-to-EBITA multiple will be biased downward. For instance, when only debt plus equity is divided by EBITA for Company C, the resulting multiple is only 8 times.

As a general rule, any nonoperating asset that does not contribute to EBITA should be removed from enterprise value. This includes not only the market value of excess cash and nonconsolidated subsidiaries, as just mentioned, but also excess real estate, other investments, and the market value of prepaid pension assets. Financial claims include debt and equity, but also minority interest, the value of unfunded pension liabilities, and the value of employee grants outstanding. A detailed discussion of nonoperating assets and financial claims is presented in Chapter 14.

Two of the trickier adjustments are for leases and pensions. Companies with significant operating leases will have an artificially low enterprise value (because we are ignoring the value of lease-based debt) and an artificially low EBITA (because rental expense includes interest costs). To compare companies with significantly different leasing policies, increase enterprise value by the value of operating leases and increase EBITA by the embedded interest. The valuation of operating leases is discussed in Chapter 20. For pensions and other retirement benefits, also explained in Chapter 20, treat the unfunded liabilities as debt or the excess assets as a nonoperating asset. In addition, exclude the nonoperating parts of pension expense from EBITA.

USE THE RIGHT PEER GROUP

Selecting the right peer group is critical to coming up with a reasonable valuation using multiples. Common practice is to select a group of 8 to 15 peers and take the average of the multiples of the peers. Getting a reasonable valuation, though, requires judgment about which companies and their multiples are truly relevant for the valuation.

A common approach to identifying peers is to use the Standard Industrial Classification (SIC) codes or the newer Global Industry Classification Standard (GICS) system developed by Standard & Poor's and Morgan Stanley.[11]

[11] Beginning in 1997, SIC codes were replaced by a major revision called the North American Industry Classification System (NAICS). The NAICS six-digit code not only provides for newer industries but

These may be a good starting point, but they are usually too broad for a good valuation analysis. For example, UPS is included in the air freight and logistics GICS code, which includes 64 companies, most of which do not compete with UPS in its core business of delivering small parcels. Another approach is to use peers provided by the company being valued. However, companies often provide aspirational peers rather than companies that truly compete head-to-head. It is better to have a smaller number of peers of companies that truly compete in the same markets with similar products and services.

Even if you find companies that compete head-to-head, differences in performance may justify differences in multiples. Remember the value driver formula expressed as a multiple:

$$\frac{\text{Value}}{\text{EBITA}} = \frac{(1-T)\left(1-\frac{g}{\text{ROIC}}\right)}{\text{WACC}-g}$$

or

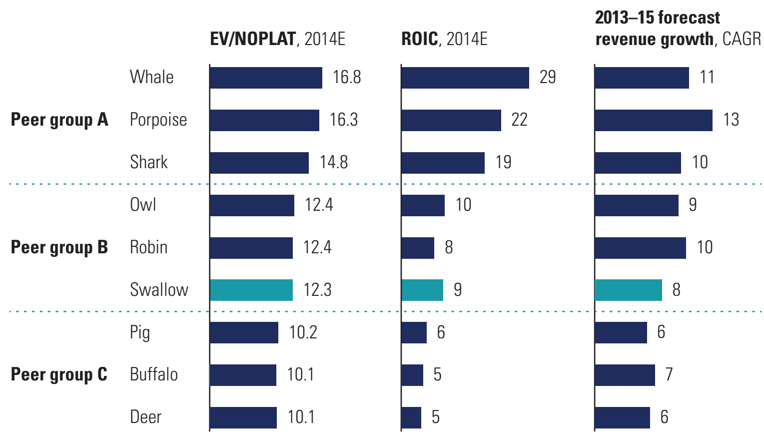
$$\frac{\text{Value}}{\text{NOPLAT}} = \frac{\left(1-\frac{g}{\text{ROIC}}\right)}{\text{WACC}-g}$$

As both versions of the formula indicate, a company's EBITA or NOPLAT valuation multiple is driven by growth (g), ROIC, and the weighted average cost of capital (WACC). While most peers will have similar costs of capital, the other variables may be different, leading to differences in expected multiples.

A common flaw is to compare a particular company's multiple with an average multiple of other companies in the same industry, regardless of differences in their performance. Better to use a smaller subsample of peers with similar performance. Exhibit 16.10 shows the multiples of nine disguised companies that manufacture equipment and provide services for oil and gas drilling. The EV-to-NOPLAT multiples range from approximately 10 times to almost 17 times. The company being evaluated, Swallow, had a multiple of 12 times, at the lower end of the range. Does this mean the company is undervalued? Probably not. When you examine the performance of the companies, you can see that they neatly divide into three groups: a top group with multiples of about 15 to 17 times, a middle group with multiples of about 12 times, and a low group with multiples of about 10 times. Note that the ROIC and growth rates line up with the ranges of multiples. Swallow, with a multiple of 12 times, is valued right in line with the other two companies (Owl and Robin) that have similar ROIC and growth. If you didn't know Swallow's multiple, your best estimate would be the average of Owl and Robin, 12 times, not the average of the entire sample or some other sample.

also reorganizes the categories on a production/process-oriented basis. The Securities and Exchange Commission (SEC), however, still lists companies by SIC code.

EXHIBIT 16.10 **Peer Groups by ROIC and Growth**



Once you have collected a list of peers and measured their multiples properly, the digging begins. You must answer a series of questions: Why are the multiples different across the peer group? Do certain companies in the group have superior products, better access to customers, recurring revenues, or economies of scale? If these strategic advantages translate to superior ROIC and growth rates, better-positioned companies should trade at higher multiples.

ALTERNATIVE MULTIPLES

Although we have so far focused on enterprise value multiples based on EBITA or NOPLAT, other multiples can prove helpful in certain situations. The EV-to-revenues multiple can be useful in bounding valuations with volatile EBITA. The P/E-to-growth (PEG) ratio somewhat controls for different growth rates across companies. Nonfinancial multiples can be useful for young companies where current financial information is not relevant. This section discusses each of these alternative multiples.

Enterprise Value to Revenues

In most cases, EV-to-revenues multiples are not particularly useful for explaining company valuations, except in industries with unstable or negative profits. We'll use a simple example to illustrate. Companies A and B have the same expected growth, ROIC, and cost of capital; the only difference is that A's EBITA margin is 10 percent, while B's is 20 percent (B is more capital intensive, so its higher margin is offset by its greater invested capital). Because the companies have the same ROIC and growth, their EV-to-EBIT ratios must be the same (13 times based on the value driver formula). But the resulting EV-to-revenues multiple is 1.3 for A and 2.6 for B. In this case, the EV-to-revenues multiple tells us nothing about the valuations of the companies.

EV-to-revenues multiples are useful as a last resort in several situations. One is in the case of start-up industries, where profits are negative or a sustainable margin level can't be estimated. Another is in industries with highly volatile profit margins, where you believe that over the long term the companies will have roughly similar profit margins. You might also find situations where a company is periodically spending more on research and development (R&D) or marketing than its peers, so its earnings are temporarily depressed. If investors are confident about the return to profit margins similar to those of peers, an EV-to-revenues multiple in line with peers might prove more relevant than an EV-to-EBITA multiple that is out of line with peers.

PEG Ratio

Some analysts and investors use a P/E-to-growth (PEG) ratio to assess the value of a company. For example, a company with a P/E of 15 and expected growth of 4 percent would have a PEG ratio of 3.75:

$$\text{PEG ratio} = \frac{\text{P/E}}{\text{Growth} \times 100} = \frac{15}{4\% \times 100} = 3.75$$

The PEG ratio is seriously deficient, however, because it doesn't take into consideration ROIC, which, as seen earlier, has a significant impact on a company's valuation.

While the concept of relating P/E to growth is relevant, there is no mathematical derivation that says you can simply divide one by the other and get a meaningful result. Furthermore, there is no standardized approach for PEG ratios, particularly the choice of time horizon for growth. Should it be one year, five years, or a decade? The choice of horizon can make a big difference, as growth tends to flatten out over time. A company with 6 percent expected growth over five years may have only 4 percent expected growth over 10 years. Shifting the growth horizon, in this case, would increase a company's PEG ratio by 50 percent. Finally, as you increase the time frame, growth rates in an industry will converge, so you will end up with differences in the PEG ratios just reflecting differences in P/Es.

The bigger problem, though, is ignoring ROIC. Exhibit 16.11 shows a DCF valuation we conducted for two companies. Company A has a higher ROIC (30 percent versus 14 percent for B), while Company B has higher growth (10 percent versus 5 percent for A). The DCF valuations of both companies at a 9 percent cost of capital and no debt lead to the same earnings multiple, 17 times. But Company A's PEG ratio is 3.4, while B's is 1.7. The common interpretation

EXHIBIT 16.11 **PEG Ratios Distorted by ROIC Differences**

	Company A	Company B
ROIC, %	30	14
Expected growth years 1–10, %	5	10
Expected growth after year 10, %	3	3
WACC, %	9	9
P/E = EV/NOPLAT, times	17.0	17.0
PEG ratio, times	3.4	1.7

is that Company A is overvalued relative to Company B because its PEG ratio is higher. Yet it's clear that both companies are valued the same when both growth and ROIC are taken into account.

Multiples of Invested Capital

In some industries, multiples based on invested capital can provide better insights than earnings multiples. A recent example comes from the banking industry. From 2008 through 2014 (as of this writing), there was tremendous uncertainty about what levels of return on equity banks would be able to earn.[12] Furthermore, earnings forecasts one to three years out were not reliable and were often negative. Most investors resorted to using multiples of equity. Banks with higher expected long-term returns on equity, based on their mix of businesses and the underlying economics of those businesses, tended to have higher multiples than banks in lower-return businesses. For example, banks whose portfolios emphasized wealth management and transactions processing, which are stable and earn high returns, were valued at higher multiples to equity than banks focused on more volatile and lower-return investment banking and retail banking.

Multiples Based on Operating Metrics

Sometimes company valuations use multiples of operating metrics. For example, values of oil and gas companies are sometimes expressed as value per barrel of oil reserves. Clearly, the amount of oil reserves in the ground the company has access to will drive the company's value. However, while the value of each barrel once it is extracted and sold is roughly the same, the costs to extract those barrels will vary widely and affect profit per barrel, depending on the geology of those reserves and the techniques needed to extract them. As a result, value per barrel is only useful to value companies against peers with similar extraction costs.

[12] As explained in Chapter 34, we use return on equity for banks, rather than return on capital.

In the late 1990s, numerous Internet companies went public with meager sales and negative profits. Valuing the young companies was a struggle because of the great uncertainty surrounding potential market size, profitability, and required investments. Financial multiples that normally provide a benchmark for valuation were rendered useless because profitability (measured in any form) was often negative.

To overcome this shortcoming, academics and practitioners alike relied on nonfinancial multiples, which compare enterprise value with one or more nonoperating financial statistics, such as website hits, unique visitors, or number of subscribers. In 2000, *Fortune* reported market-value-to-customer multiples for a series of Internet companies.[13] *Fortune* determined that Yahoo! was trading at $2,038 per customer, Amazon.com at $1,400 per customer, and NetZero at $1,140 per customer.

Effective use of a nonfinancial multiple requires that the nonfinancial metric be a reasonable predictor of future value creation, and thus somehow tied to ROIC and growth. In the examples from *Fortune*, Yahoo! traded at a higher multiple than Amazon.com because investors expected that Yahoo!'s profit per user would be higher than Amazon's.

The first academic study about late-1990s Internet valuations found that the number of unique visitors to a website or the number of pages on a site viewed per visit was directly correlated to a company's stock price, even after controlling for the company's current financial performance.[14] The power of a given nonfinancial metric, however, depended on the company. For portal and content companies such as Yahoo!, page views and unique visitors were both correlated to a company's market value. For online retailers such as Amazon.com, only the page views per visit were correlated with value. Evidently, the market believed that merely stopping by would not translate to future cash flow for online retailers.

As the industry matured, however, financial metrics became increasingly important. Later research found that gross profit and R&D spending became increasingly predictive, whereas nonfinancial data lost power.[15] This research indicates a return to traditional valuation metrics for new industries as they mature and once financial metrics became meaningful.

A problem with multiples, particularly nonfinancial multiples, is that they are relative valuation tools. They measure one company's valuation relative to another's, normalized by some measure of size. They do not measure absolute valuation levels. At the height of the Internet bubble, you could argue that

[13] E. Schonfeld, "How Much Are Your Eyeballs Worth?" *Fortune*, February 21, 2000, 197–200.

[14] B. Trueman, M. H. F. Wong, and X. J. Zhang, "The Eyeballs Have It: Searching for the Value in Internet Stocks," *Journal of Accounting Research* 38 (2000): 137–162.

[15] P. Jorion and E. Talmor, "Value Relevance of Financial and Non Financial Information in Emerging Industries: The Changing Role of Web Traffic Data" (working paper no. 021, London Business School Accounting Subject Area, 2001).

many companies were overvalued relative to potential cash flows rendering relative valuations useless except to short-term traders.

SUMMARY

Of the available valuation tools, discounted cash flow continues to deliver the best results. However, a thoughtful comparison of selected multiples for the company you are valuing with multiples from a carefully selected group of peers merits a place in your tool kit as well. When that comparative analysis is careful and well reasoned, it not only serves as a useful check of your DCF forecasts, but also provides critical insights into what drives value in a given industry. Just be sure that you analyze the underlying reasons that multiples differ from company to company, and never view multiples as a shortcut to valuation. Instead, approach your multiples analysis with as much care as you bring to your DCF analysis.

17

Valuation by Parts

Up to this point, our analysis has focused on single-business companies. But many large companies have multiple business units, each competing in segments with different economic characteristics. For instance, Anglo-Dutch Unilever competes in food and beverages, personal products, and household products. Even so-called pure-play companies, such as Vodafone (mobile telecommunication services) and Pfizer (prescription pharmaceuticals), often have a wide variety of underlying geographical and category segments. If the economics of a company's segments are different, you will generate more insights by valuing each segment and adding them up to estimate the value of the entire company. Trying to value the entire company as a single enterprise will not provide much insight, and your final valuation may be way off the mark. Consider a simple case where a faster-growing segment has lower returns on capital than a slower-growing segment. If both segments maintain their return on invested capital (ROIC), the corporate ROIC would decline as the weights of the different segments change.

Valuing by parts generates better valuation estimates and deeper insights into where and how the company is generating value. That is why it is standard practice in industry-leading companies and among sophisticated investors. This chapter explains four critical steps for valuing a company by its parts:

1. Understanding the mechanics of and insights from valuing a company by the sum of its parts
2. Building financial statements by business unit—based on incomplete information, if necessary
3. Estimating the weighted average cost of capital by business unit
4. Testing the value based on multiples of peers

VALUING BY PARTS: MECHANICS AND INSIGHTS

The most effective way to explore the mechanics of valuing by parts, as well as the insights that can result, is to work through the valuation of a real or hypothetical company. Exhibit 17.1 details the key financials, value drivers, valuation results, and multiples for each part of ConsumerCo, a hypothetical business. Its parts are four business units, a financial subsidiary, and a nonconsolidated joint venture. To simplify, we kept all future returns and growth rates constant at 2015 levels for each business unit.

ConsumerCo's businesses all sell products for personal care, but their economics differ widely. The key financials and value drivers in Exhibit 17.1 make this evident. The company's primary business unit, branded consumer products, sells well-known brands in personal care (mainly skin creams, shaving creams, and toothpaste). It generates $2.0 billion in revenues at returns well above its 8.6 percent cost of capital, but mainly in slow-growth, mature markets. Private label, the next largest business at $1.5 billion in revenues, produces for large discount chains selling products under their own names. This unit is growing faster than the branded products business, but at far lower returns on capital that barely meet its cost of capital.

The devices business, with $1.25 billion in revenues, sells electronic devices for personal care, such as sun beds, shavers, and toothbrushes, at a very healthy 18.1 percent return on capital, paired with high growth rates. The newly developed organic-products business has $750 million in revenues in premium products made with natural materials. It generates both the highest returns and the highest growth. The $83 million in annual costs for running the corporate center are shown as a separate business unit. Finally, internal revenues, earnings before interest, taxes, and amortization (EBITA), and invested capital are eliminated in the consolidation of ConsumerCo's financials, as the branded-products business buys components from the private-label business unit.

The discounted-cash-flow (DCF) valuation results and multiples in Exhibit 17.1 reflect these differences in size, growth, and return on capital across the businesses. Not surprisingly, the high returns and large scale in branded products lead to the largest valuation ($5,188 million), and the implied multiple of enterprise value (EV) to net operating profit less adjusted taxes (NOPLAT) is 16.0 times. The private-label business generates almost a third of the company's revenues but contributes only around 10 percent of value ($1,128 million) because of its low returns on capital. Despite its higher growth rate, its EV/NOPLAT multiple of 12.2 is lower than that of the branded-products unit. The devices business, with returns well above cost of capital and growth rates exceeding those of private-label products, is valued at $1,474 million and has a multiple of 14.5 times NOPLAT. The organic-products business combines high returns with high growth, achieving a value of $3,440 million, second highest after branded products, but at a much higher implied multiple of 25.7 times NOPLAT. With headquarters DCF at a negative $1,123 million and no impact

EXHIBIT 17.1 **ConsumerCo: Valuation Summary, January 2015**

	Key financials $ million			Value drivers %													Valuation $ million	Multiples	
	Revenue	EBITA	Invested capital	Revenue growth				Operating margin				ROIC				WACC	DCF value	EV/ NOPLAT	EV/ NOPLAT
	2015	2015	2015	2013	2014	2015	2015–20	2013	2014	2015	2015–20	2013	2014	2015	2015–20				Peers
Branded products	2,000	500	1,600	1.5	2.5	3.0	3.0	23.0	24.3	25.0	25.0	19.7	19.9	20.3	20.3	8.6	5.188	16.0	15.6
Private label	1,500	143	900	4.6	4.7	5.0	5.0	7.7	8.5	9.5	9.5	8.5	9.3	10.3	10.3	9.1	1,128	12.2	11.7
Devices	1,250	156	563	7.1	7.3	7.5	7.5	11.2	12.0	12.5	12.5	15.8	17.1	18.1	18.1	10.1	1,474	14.5	14.0
Organic products	750	206	488	9.3	9.5	10.0	10.0	27.6	27.3	27.5	27.5	27.6	27.5	27.5	27.5	8.6	3,440	25.7	24.5
Corporate center	–	(83)	806	4.4	5.0	5.4	5.6[1]									9.1	(1,123)	20.9	–
Eliminations	(500)	(2)	(50)														–	–	–
Total operations	5,000	920	4,306	4.5	5.1	5.5	5.7	17.7	18.4	18.4	18.3	12.6	13.2	13.9	14.7		10,107	16.9	
Customer finance																10.5[2]	150[3]	12.1	12.0
Cosmetics joint venture																9.1	609[4]	17.6	17.0
Excess cash																	250		
Gross enterprise value																	11,117		
Debt																	(1,941)[5]		
Equity value																	9,175		

1 For HQ: growth of HQ costs.
2 For customer finance: P/E cost of equity.
3 At equity value, net of debt in customer finance.
4 Equity value of minority stake in cosmetics joint venture.
5 Excluding debt in customer finance: $1,038 million.

on value from eliminations (see later in this chapter), the value of operations for ConsumerCo totals $10,107 million, corresponding to a weighted average multiple of 16.9 times NOPLAT.

ConsumerCo's customer finance subsidiary provides loans for about a quarter of device revenues. It is valued at $150 million (net of $1,038 million of debt) using cash flow to equity discounted at its cost of equity of 10.5 percent (see the next section). The cosmetics joint venture is valued using an enterprise DCF valuation, but only ConsumerCo's 45 percent stake of equity valued at $609 million is shown, because it is not consolidated.

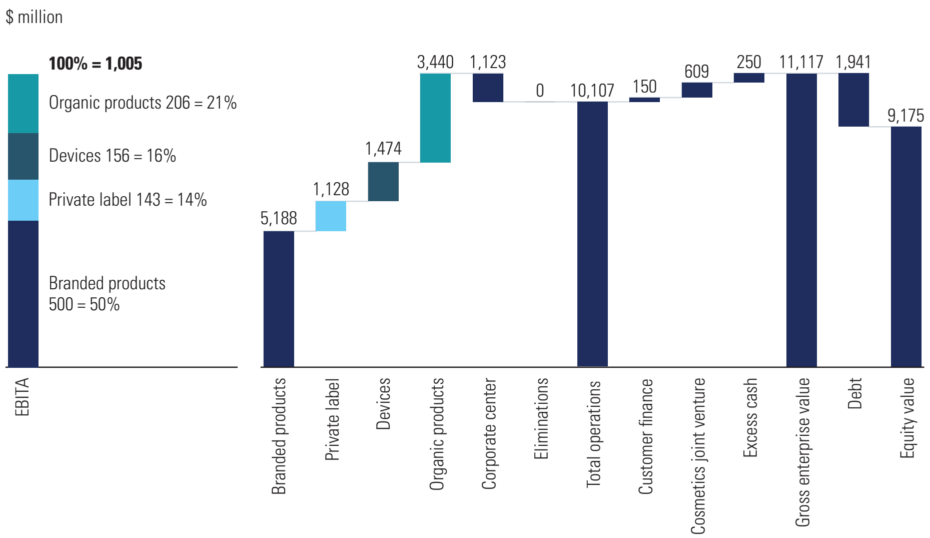
The combined total of ConsumerCo's businesses, including the finance subsidiary, the cosmetics joint venture, and $250 million of excess cash, is $11,117 million. Subtracting $1,941 million of debt (excluding the portion allocated to the finance subsidiary from the company's total debt of $2,980 million) leads to an equity value of $9,175 million.

ConsumerCo's results illustrate why valuation by parts leads to better results. For example, even while all business units are at constant (but different) growth rates and returns on capital, ConsumerCo's overall growth and return continue to change between 2015 and 2020 as the weight of organic products in the portfolio is steadily increasing. When the economics of business segments differ greatly, it becomes hard to understand historical patterns and to project future trajectories for a company's returns and growth via a purely top-down approach. Also note how large the differences in multiples are across the businesses (from 12.2 to 25.7 times NOPLAT) and how the aggregate multiple for the operating enterprise value matches none of the underlying businesses.

Another way to see how these differences matter is to compare the units' relative contributions to value and earnings. Exhibit 17.2 illustrates ConsumerCo's equity value buildup (also see Chapter 14) from its six business segments, corporate center, excess cash, and debt. Branded and organic products are generating the bulk of the company's value. On the left side of Exhibit 17.2, the breakdowns by business unit of the valuation and the EBITA differ, showing that segments' relative earnings are not a good proxy for their relative contributions to the company's aggregate value. This underscores the need for a valuation approach that recognizes the differences in the underlying return on capital and growth across ConsumerCo's segments.

Perhaps more important, a valuation-by-parts approach offers insights into the sources and drivers of a company's value creation that a purely top-down view cannot reveal. The organic-products business offers the highest value creation in the portfolio, in terms of operating value relative to capital invested. Given the high returns on capital for the organic-products unit, growth through additional investments in that business would create more value for the company than investments in other units. In contrast, the private-label unit creates the least amount of value, due to its low returns on capital. Improving returns is the best way to generate more value from this segment. To maximize value

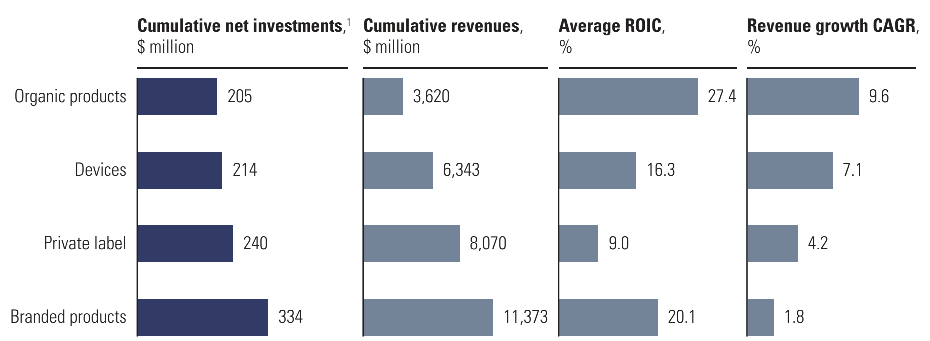
EXHIBIT 17.2 **ConsumerCo: Enterprise to Equity Value Buildup, January 2015**



creation, ConsumerCo management should differentiate priorities for growth and return across its segments, rather than set company-wide targets.

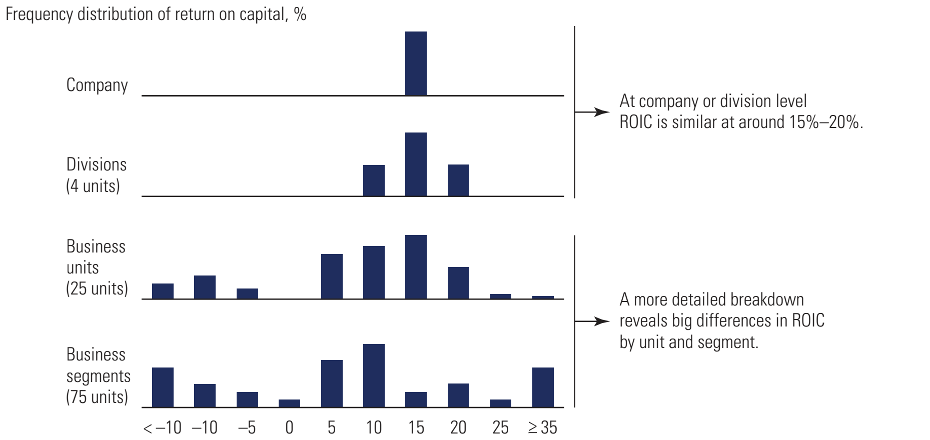
Many companies, ConsumerCo among them, struggle with such differentiation. As the investment map in Exhibit 17.3 shows, its capital expenditures over the five years from 2010 to 2015 have been more in line with the size of each business than with their returns or growth. Investments were largest in the private-label and branded-products businesses, and lowest in organic products. In the typical annual budgeting process, many companies routinely allocate their capital, research and development (R&D), and marketing budgets to

EXHIBIT 17.3 **ConsumerCo: Historical Investments, 2010–2015**



[1] Capital expenditures plus investments in net working capital minus depreciation.

EXHIBIT 17.4 **Breakdown of ROIC**



the same activities year after year, regardless of their relative contribution to value creation. The cost is high, since companies that more actively reallocate resources generate, on average, 30 percent higher total returns to shareholders (TRS).[1] A valuation by parts can highlight whether a company's capital spending is aligned with its value-creation opportunities.

Sometimes securing the best insights requires even more finely grained valuations than the ConsumerCo example provides. When we analyzed four divisions within a consumer durable-goods company, we found that all were generating fairly similar returns, between 12 and 18 percent, well above the company's 9 percent cost of capital (see Exhibit 17.4). But at the next level, business units' returns were much more widely distributed. Even in the company's highest-performing division, a business unit was earning returns below its cost of capital. At the level of individual activities within business units, the return distribution was even larger. Differentiating where to invest in growth and where to improve margins at such granular levels can trigger significant improvements in value creation for the company as a whole.[2]

BUILDING BUSINESS UNIT FINANCIAL STATEMENTS

To value a company's individual business units, you need income statements, balance sheets, and cash flow statements. Ideally, these financial statements

[1]S. Hall, D. Lovallo, and R. Musters, "How to Put Your Money Where Your Strategy Is," *McKinsey Quarterly* (March 2012).
[2]M. Goedhart, S. Smit, and A. Veldhuijzen, "Unearthing the Source of Value Hiding in Your Corporate Portfolio," *McKinsey on Finance* (Fall 2013).

should approximate what the business units would look like if they were standalone companies. Creating financial statements for business units requires consideration of several issues:

- Allocating corporate overhead costs
- Dealing with intercompany transactions
- Understanding financial subsidiaries
- Navigating incomplete public information

We will illustrate each of these issues by extending the ConsumerCo example.

Corporate Overhead Costs

Most multibusiness companies have shared services and corporate overhead, so you need to decide which costs should be allocated to the businesses and which retained at the corporate level. For services that the corporate center provides, such as payroll, human resources, and accounting, allocate the costs by cost drivers. For example, the aggregate cost of human resources services provided by the corporate parent can be allocated by the number of employees in each business unit.

When costs are incurred because the units are part of a larger company (for example, the CEO's compensation or the corporate art collection), do not allocate the costs. They should be retained as a corporate cost center and valued separately for two reasons. First, allocating corporate costs to business units reduces your ability to compare them with pure-play business unit peers that don't incur such costs (most business units already have their own chief executives, CFOs, and controllers who are comparable to pure-play competitors). Second, keeping the corporate center as a separate unit reveals how much of a drag it creates on the company's value.

For ConsumerCo, the corporate costs are estimated at $83 million, around 1.7 percent of revenue, with a present value amounting to about 10 percent of enterprise value. These percentages are not uncommon for multibusiness companies.

Intercompany Transactions

Sometimes business units provide goods and services to one another, incur intragroup payables and receivables, and borrow and lend funds to a group treasury. To arrive at consolidated corporate results, accountants eliminate the internal revenues, costs, and profits as well as internal assets and liabilities to prevent double-counting. Only revenues, costs, assets, and liabilities from transactions with external parties remain at the consolidated level. Exhibit 17.5

EXHIBIT 17.5 **ConsumerCo: Intercompany Eliminations and Consolidation, 2015**

$ million

	Branded products	Private label	Devices	Organic products	Corporate center	Customer finance	ConsumerCo parent company	Eliminations I	Eliminations II	ConsumerCo consolidated
NOPLAT										
Revenues	2,000	1,500	1,250	750	–	–		(500)	–	5,000
Operating costs	(1,500)	(1,358)	(1,094)	(544)	(83)	–		498	–	(4,080)
EBITA	500	143	156	206	(83)	–	–	(2)		920
Taxes on EBITA	(175)	(50)	(55)	(72)	29	–	–	–	–	(323)
NOPLAT	325	93	102	134	(54)	–	–	(2)	–	597
Income from associates/joint venture	–	–	–	–	–	–	972	–	(942)	30
Interest income	–	–	–	–	–	77	16	–	–	93
Interest expense	–	–	–	–	–	(58)	(118)	–	–	(177)
Taxes on nonoperating items	–	–	–	–	–	(7)	(304)	–	330	19
Net income	325	93	102	134	(54)	12	565	(2)	(612)	563
Invested capital										
Accounts receivable	240	105	31	113	–	–	–	–	–	489
Accounts payable	(216)	(74)	25	90	–	–	–	–	–	(175)
Inventory	700	375	500	150	–	–	–	(50)	–	1,675
Net PP&E	876	494	6	135	806	–	–	–	–	2,317
Invested capital	1,600	900	563	488	806	–	–	(50)	–	4,306
Excess cash	–	–	–	–	–	–	250	–	–	250
Intercompany receivables	300	–	450	–	–	–	200	–	(950)	–
Loans	–	–	–	–	–	1,154	–	–	–	1,154
Investments in associates/joint venture	–	–	–	–	–	–	5,097	–	(5,021)	76
Total funds invested	1,900	900	1,013	488	806	1,154	5,547	(50)	(5,971)	5,785
Intercompany payables	–	200	–	–	–	–	750	–	(950)	–
Debt and debt equivalents	–	–	–	–	–	1,038	1,941	–	–	2,980
Adjusted equity	1,900	700	1,013	488	806	115	2,856	(50)	(5,021)	2,806
Total funds invested	1,900	900	1,013	488	806	1,154	5,547	(50)	(5,971)	5,785

shows how the 2015 reorganized financials for ConsumerCo's businesses are consolidated with the accounts of the parent company, ConsumerCo Corporation. In this example, ConsumerCo Corporation has no business activities and only holds the equity stakes in the business subsidiaries and most of the group's debt.

Intercompany sales and profits ConsumerCo's private-label segment sells raw materials to the open market but also provides materials to the branded-products unit, generating $500 million of internal sales in 2015 (see Exhibit 17.5 in the first line under Eliminations I). If the branded-products unit would process and resell all transferred materials in the same year, $500 million of internal revenues and internal costs could simply be eliminated in the consolidation. Since one unit's revenues are another unit's costs, overall earnings are unaffected.[3]

But, as is often the case for intercompany sales, ConsumerCo's branded-products unit typically does not process and resell all of the private-label deliveries in the same year. Because of the resulting inventory changes of internally supplied materials, one unit's revenues are no longer another unit's costs, and some earnings and inventory now must be eliminated in the consolidation as well. In 2015 the branded-products unit resells 90 percent of the internal supplies of $500 million, with the remaining 10 percent added to its inventory at the preprocessing cost ($50 million). In 2015 it also processes and resells $48 million of inventory remaining from internal transfers in 2014. Because of these timing differences in transferring and processing, $50 million of 2015 internal sales by the private-label business do not show up as operating costs in the branded-products business in that year, and $48 million of branded-products operating costs are not part of the year's internal sales by the private-label unit.

To consolidate the income statement, we eliminate the private-label group's internally generated revenue of $500 million, but only $498 million of the branded-products group's cost of goods sold ($500 million worth of internally transferred materials, minus $50 million of ending inventory, plus $48 million of beginning inventory). The net effect would eliminate $2 million in earnings for ConsumerCo's consolidated financials (see the Eliminations I column in Exhibit 17.5).[4] As for ConsumerCo, in most situations, the earnings impact is small because it is driven by the change in inventory, not the ending inventory. In addition, the $50 million of ending inventory of internal supplies is eliminated in ConsumerCo's 2015 consolidated financials, with

[3]The cumulative value of business units will equal the aggregate value, but the value split depends on the level of transfer pricing between the two units. The higher the transfer price, the more aggregate value is transferred to the private-label business. To value each business unit accurately, record intercompany transfers at the value that would be transacted with third parties. Otherwise, the relative value of the business units will be distorted.

[4]There is no impact on cash taxes or NOPLAT from the accounting consolidation. We abstract from any impact of tax consolidation (fiscal grouping) in this example.

a corresponding deduction from adjusted equity. However, note that in any case, the earnings elimination cannot affect ConsumerCo's aggregate free cash flow and enterprise DCF valuation, because consolidation adjustments to inventory always offset the changes in NOPLAT.[5]

When you build and forecast the financial statements for the business units, treat the eliminations as a stand-alone business unit similar to the corporate center. The growth rate of intercompany sales can be estimated from the details of how and why these items arise. It is simplest to assume that the eliminations grow at the same rate as the entire group or as the receiving businesses. Remember, however, that the eliminations are used only to reconcile business-unit forecasts to the consolidated-enterprise forecasts. They do not affect the value of the company or the individual business units.

Intercompany financial receivables and payables Multibusiness companies typically manage cash and debt centrally for all business units, which can lead to intercompany receivables from, and payables to, the corporate parent. Sometimes these intercompany accounts are driven by tax considerations. For example, one business unit might lend directly to another unit so that funds don't flow through the parent company, which could trigger additional taxes. Sometimes the accounts have no economic purpose but are simply an artifact of the company's accounting system. Regardless of their purpose, intercompany receivables and payables should not be treated as part of operating working capital but as intercompany equity in the calculation of invested capital.

Exhibit 17.5, under Eliminations II, demonstrates how this occurs for ConsumerCo. The parent company has $5,097 million of equity investments in its subsidiaries, of which $700 million is in the private-label unit, for example, as reflected in the equity of the subsidiary accounts. This accounting treatment is for internal reports only; since ConsumerCo Corporation owns the private-label business in its entirety, its financial statements are consolidated for external reports, eliminating the $700 million of equity investment. (The same holds for the other businesses shown. This leads to the elimination of $5,021 million of equity investments in consolidation, leaving only the $76 million stake in the minority-owned cosmetics joint venture as equity investment in the consolidated accounts.)

In addition, ConsumerCo Corporation has lent $200 million to the private-label unit, which shows up as an intercompany receivable for the parent company and an intercompany payable for the private-label unit. For the parent company, it represents a nonoperating asset that does not generate operating profits and hence should not be included in its operating working capital. For private label, it represents a financial infusion that is similar to equity. In

[5]For ConsumerCo, there is $50 million of inventory elimination in 2015 versus $48 million in 2014, which itself leads to a decrease of consolidated inventory of $2 million for 2015, offsetting the earnings deduction for that year.

the consolidated financials, the amounts are eliminated. Similarly, the intercompany receivables for the branded-products and devices businesses are treated as nonoperating assets that are eliminated in the consolidated financials against the $750 million of parent intercompany payables. Failure to handle the intercompany receivables and payables correctly can generate seriously misleading results. In ConsumerCo's example, if the intercompany accounts had been treated as working capital instead of equity, the private-label business's invested capital would have been understated by more than 20 percent, leading to an overstatement of ROIC by roughly the same percentage.

Financial Subsidiaries

Some firms have financial subsidiaries that provide financing for customers (for example, John Deere Financial) or operate independent financial businesses (GE Capital). If these subsidiaries are majority owned, they are fully consolidated in the company financial statements. But balance sheets of financial businesses are structured differently from those of industrial or service businesses. The assets tend to be financial rather than physical (largely receivables or loans) and are usually highly leveraged. As detailed in Chapter 34, financial businesses should be valued using cash flow to equity, discounted at the cost of equity. Most companies with significant financial subsidiaries provide a separate balance sheet and income statement for those subsidiaries, which can be used to analyze and value the financial subsidiaries separately.

Exhibit 17.5 shows that in 2015 ConsumerCo's customer-finance unit has $1,154 million in outstanding customer loans. We estimated the ratio of debt to customer loans required to maintain its current BBB credit rating at 90 percent, so that its funding consists of $1,038 million of debt (0.90 × $1,154 million) and $115 million of equity. The loans generate $77 million in annual interest income. After deducting $58 million of interest expenses on debt, after-tax net income of $12 million remains. The return on equity for the customer-finance unit is 10.8 percent ($12 million of net income divided by $115 million of equity), just above its 10.5 percent cost of equity (see also Exhibit 17.1). These loans, debt, and financial income streams need to be valued separately from ConsumerCo's business operations. Looking ahead, the customer-finance unit's loans are assumed to grow in line with the devices business's revenues (for which it provides the customer loans). Keeping interest rates and the ratio of debt to customer loans stable at 90 percent, the cash-flow-to-equity DCF value is estimated at $150 million.

Be careful not to double-count the debt of the financial subsidiary in the overall valuation of the company. The equity value of the customer-finance subsidiary is already net of its $1,038 million debt, so when we subtracted debt from ConsumerCo's total enterprise value to arrive at the consolidated company's equity value in Exhibit 17.1, we subtracted only the $1,941 million debt associated with business operations.

EXHIBIT 17.6 **ConsumerCo: Public Information for Business Segments, 2015**

$ million

Reported financials	Branded products	Private label	Devices	Organic products	Corporate	Intersegment eliminations	Consolidated
Revenues	2,000	1,500	1,250	750	–	(500)	5,000
Operating profit	500	143	156	206	(83)	(2)	920
Depreciation[1]	150	59	57	31	42	–	338
Capital expenditures	208	107	90	79	42	–	526
Assets	1,872	882	596	531	830	(50)	4,662
Estimating invested capital							
Assets/total assets, %	40	19	13	11	18		100
Invested capital estimate, $ million	1,711	806	545	486	759		4,306
Invested capital actual, $ million	1,600	900	563	488	806		4,306
Estimation error, %	6.9	(10.4)	(3.1)	(0.4)	(5.9)		

[1] Included in operating profit.

Navigating Public Information

For our ConsumerCo example, we have the benefit of complete financial statements by business unit. But that will typically not be the case if you are valuing a multibusiness company from the outside in. Exhibit 17.6 shows the disclosure of financial information typical of U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) for a company like ConsumerCo. Companies disclose revenues, operating profit (or something similar such as EBITA), depreciation, capital expenditures, and assets by segment. You need to convert these items to NOPLAT and invested capital.

NOPLAT To estimate NOPLAT, start with reported EBITA by business unit. Next, allocate operating taxes, the pension adjustment (to eliminate pension accounting), and the operating lease adjustment (eliminating interest expense embedded in rental expense) to each of the business units. (For more information on these adjustments, see Chapter 9.) Use the effective overall corporate tax rate for all business units unless you have information to estimate each unit's tax rate. For the ConsumerCo example, this would have resulted in exactly the right NOPLAT per business unit, because there are no pension, lease, or other adjustments needed on reported EBITA (though this is not typically the case).

After estimating NOPLAT, reconcile the sum of all business unit NOPLATs to consolidated net income in order to ensure that all adjustments have been properly made.

Invested capital To estimate invested capital, start with total assets by business unit, and subtract estimates for nonoperating assets and non-interest-bearing operating liabilities. (Note that many companies will hold nonoperating assets at the corporate level, not the unit level. In that case, no adjustment is necessary.) Nonoperating assets include excess cash, investments in nonconsolidated subsidiaries, pension assets, and deferred tax assets. Non-interest-bearing operating liabilities include accounts payable, taxes payable, and accrued expenses. They can be allocated to the business units by either revenue or total assets. As discussed in the earlier section on intercompany payables and receivables, do not treat intercompany loans and debt as an operating liability.

Then allocate the invested capital for the consolidated entity to all of its business units by the amount of total assets minus nonoperating assets and non-interest-bearing liabilities for each business unit. To measure invested capital excluding goodwill, subtract allocated goodwill by business unit. For ConsumerCo, you could have allocated its total operating invested capital (excluding the customer loans and joint venture, of course) to each of the business units by total assets as reported before intersegment eliminations. Note that this would have resulted in some estimation errors, such as allocating \$1,711 million invested capital (calculated as \$1,872/\$4,712 × \$4,306 million) to branded products when its true invested capital is \$1,600 million.

Once you have estimated invested capital for the business units and corporate center, reconcile these estimates with the total invested capital derived from the consolidated statements.

COST OF CAPITAL

Each business segment should be valued at its own cost of capital, because the systematic risk (beta) of operating cash flows and their ability to support debt—that is, the implied capital structure—will differ by business. To determine an operational business unit's weighted average cost of capital (WACC), you need the unit's target capital structure, its cost of equity (as determined by its levered beta), and its cost of borrowing. For a financial business, you simply need the cost of equity following from its equity beta. (For details on estimating the cost of equity and WACC, see Chapter 13). The results for ConsumerCo's segments are summarized in Exhibit 17.7.

First, we estimate the target capital structure in terms of the debt-to-equity (D/E) ratio for each of ConsumerCo's business units. We recommend using the median capital structure of publicly traded peers, especially if most peers have similar capital structures. Next, we determine the levered beta, cost of equity, and WACC. To determine a business unit's beta, first estimate an unlevered median beta for its peer group (be thoughtful about which companies to include, especially outliers). Relever the beta using the same business unit's

EXHIBIT 17.7 **ConsumerCo: WACC Estimates, January 2015**

Business	D/E[1]	Cost of debt,[2] %	Beta unlevered	Beta levered	Cost of equity,[3] %	WACC,[4] %	DCF value, $ million	Implied debt, $ million
Branded products	0.30	5.5	0.9	1.1	10.1	8.6	5,188	1,197
Private label	0.30	5.5	1.0	1.2	10.7	9.1	1,128	260
Devices	0.25	5.5	1.2	1.5	11.8	10.1	1,474	295
Organic products	0.25	5.5	0.9	1.1	9.9	8.6	3,440	688
Corporate center	0.30					9.4	(1,123)	(259)
Eliminations							–	–
Total operations							10,107	2,181
Customer finance								1,038
Total ConsumerCo (net debt, implied)								3,220
Excess cash, actual								(250)
Debt, actual in operations								1,941
Debt, actual in customer finance								1,038
Total ConsumerCo (net debt, actual)								2,730

[1] At target BBB credit rating.
[2] Beta of debt equals 0.2 and risk-free rate of interest equals 4.5%.
[3] Assuming market risk premium 5.0%.
[4] Tax rate 35%.

target capital structure, and estimate its WACC. For the corporate headquarters cash flows, use a weighted average of the business units' costs of capital. Most of ConsumerCo's businesses have similar betas in a range of 1.1 to 1.2, with resulting WACC estimates between 8.6 and 9.1 percent. An exception is the devices business, which is more cyclical at a beta of around 1.5 and a cost of capital of 10.1 percent. For ConsumerCo's customer-finance subsidiary, we directly estimated the equity beta of its peers in retail banking at 1.2, leading to an estimated cost of equity of 10.5 percent.

Finally, using the debt levels based on industry medians, aggregate the business unit debt to see how the total compares with the company's total target debt level (not necessarily its current level).[6] Set the headquarters target D/E at a weighted average of the business units' D/Es, as its negative cash flow is reducing the company's overall debt capacity. If the sum of business unit debt differs from the consolidated company's target debt, we typically record the difference as a corporate item, valuing its tax shield separately (or tax cost when the company is more conservatively financed). We do this to minimize differences between the estimates of the business units' cost of capital and valuation and those of their peers.

In ConsumerCo's case, the resulting aggregate target debt level for its business units and finance subsidiary is $3,220 million. That amount is above its

[6] The allocation of debt among business units for legal or internal corporate purposes is generally irrelevant to the economic analysis of the business units. The legal or internal debt is generally driven by tax purposes or is an accident of history (cash-consuming units have lots of debt). These allocations rarely are economically meaningful and should be ignored.

total current net debt of $2,730 million, or $2,980 million debt, net of $250 million excess cash (see Exhibit 17.7). If ConsumerCo would hold on to its current leverage, it would realize a loss in value relative to the value of its parts. To estimate this loss, project the lost tax shields from the company's current below-peer-level leverage into perpetuity at the overall revenue growth rate, and discount these at the unlevered cost of equity.[7]

When you value a company by summing the business unit values, there is no need to estimate a corporate-wide cost of capital or to reconcile the business unit betas with the corporate beta. The individual business unit betas are more relevant than the corporate beta, which is subject to significant estimation error and is likely to change over time as the weights of the underlying businesses in the company portfolio change.[8]

TESTING THE VALUE BASED ON MULTIPLES OF PEERS

Whenever possible, triangulate the discounted cash flow results with valuation multiples, following the recommendations made in Chapter 16. For each of the company's segments, carefully select a group of companies that are comparable not only in terms of sector but also in terms of return on capital and growth. Do not simply take an average or median of the peer group multiples. Instead, always eliminate outliers with multiples that are out of line with their underlying economics, and, where possible, estimate a median of close peers with similar returns and growth. Furthermore, we recommend using NOPLAT-based instead of EBITA-based multiples, as the latter can be distorted by tax differences across companies.

Exhibit 17.8 shows the EV-to-earnings multiples and underlying ROIC and growth for the competitors of ConsumerCo's branded-products business. Eliminated from the sample are two outliers with valuation multiples that are far above all other peers and not justified by their growth and return on capital. Note how the spread in the EBITA multiples is larger than that of the NOPLAT multiples, which are therefore a more reliable basis for the valuation.

The overall average NOPLAT multiple across the entire peer group is 18.0 times, which would suggest a significantly higher value than the DCF estimate

[7]Recall from Chapter 13 that using the cost of debt to discount tax shields significantly overestimates their value. In theory, a company's unlevered cost of equity is a complex average of the unlevered cost of equity of its underlying businesses that changes over time. You can use a simple average of the unlevered costs of equity of the underlying businesses as an approximation, as any associated error has very small impact on value. Based on a tax rate of 35 percent and an interest rate of 6 percent, the tax shields lost from $490 million in debt below target are $10.3 million for 2015. Assuming future tax shield losses would roughly grow in line with overall revenues, and discounting at ConsumerCo's unlevered cost of equity of around 9.5 percent, the loss in value would amount to around $190 million.

[8]The implied cost of capital for ConsumerCo as a whole for each future year is around 8.8 percent. It can be derived by backing it out from the sum of the underlying business units' free cash flows and the sum of the discounted values of these free cash flows.

EXHIBIT 17.8 **ConsumerCo: Multiples for Peer Branded-Product Companies, January 2015**

Company	ROIC 2015, %	Growth 2015–2020, %	EV/EBITA	EV/NOPLAT	
Peer 1	31.0	4.7	16.5	22.0	Top-peer average: 21.0
Peer 2	29.6	4.4	15.8	22.6	
Peer 3	28.5	4.5	14.3	20.4	
Peer 4	27.1	3.9	12.8	19.1	
Peer 5	22.0	3.0	12.0	16.0	Close-peer average: 15.6
Peer 6	21.1	2.8	10.5	15.7	
Peer 7	19.7	2.4	11.0	15.7	
Peer 8	19.0	2.1	10.0	15.7	
Peer 9	18.5	2.2	9.5	15.1	
Peer 10	18.3	4.0	20	26.7	Outliers
Peer 11	9.0	3.4	32	45.7	
Overall average				18.0	Excluding outliers
				21.3	Including outliers

EXHIBIT 17.9 **ConsumerCo: Valuation with Multiples, January 2015**

		EV/NOPLAT		Multiples-based value				
Business	**NOPLAT**, 2015	**Close peers**	**Top peers**	**Close peers**, $ million	**Delta to DCF**, %	**Top peers**, $ million	**Delta to DCF**, %	**DCF**, $ million
Branded products	325	15.6	21.0	5,060	(2)	6,833	32	5,188
Private label	93	11.7	16.0	1,084	(4)	1,482	31	1,128
Devices	102	14.0	19.5	1,422	(4)	1,980	34	1,474
Organic products	134	24.5	26.5	3,285	(5)	3,553	3	3,440
Corporate center	(54)			(1,123)		(1,123)		(1,123)
Eliminations	(2)	–	–	–		–		–
Total operations	597			9,727	(4)	12,726	26	10,107
Customer finance	12[1]	12.0	12.0[1]	149	0	149	0[2]	150[2]
Cosmetics joint venture	81	17.0	22.0	589	(3)	772	27[3]	609[3]
Excess cash				250		250		250
Gross enterprise value				10,716	(4)	13,897	25	11,117
Debt				(1,941)		(1,941)		(1,941)
Equity value				8,774	(4)	11,956	30	9,175

1 For customer finance: P/E and net income are shown.
2 At equity value, net of debt in customer finance.
3 Equity value of minority stake in cosmetics joint venture.

(which has an implied NOPLAT multiple of 16.0). But the peers in this group appear to be clustered in two groups with very different underlying returns and growth rates, making the overall average less meaningful. There is a group of leading players with outstanding returns and growth rates that are valued in the stock market at an average of 21.0 times NOPLAT. Based on the multiple for this top peer group, ConsumerCo's branded-products business would be valued at $6,883 million, which would be a clear overestimation, given its actual performance and growth (see Exhibit 17.9). At best, it could represent what ConsumerCo's business would be worth if it were able to attain the economics of these leading players in the sector. In contrast, the players in the peer group with returns and growth rates closer to ConsumerCo's business have an average multiple of 15.6 times NOPLAT, leading to a value estimate of $5,060 million, which is much closer to the DCF results.

Adopting the same approach of using close-peer multiples to value all of ConsumerCo's other segments, including ConsumerCo finance and the cosmetics joint venture, the estimated equity value is $8,774 million (Exhibit 17.9). Note that by using top-peer multiples for the valuation, ConsumerCo's value would be estimated some 30 percent higher than its DCF value, at $11,956 million. Showing the range of value estimates for close-peer and top-peer multiples helps to triangulate the DCF valuation results. In our experience, close-peer multiples typically lead to valuation results within 10 to 15 percent of the DCF outcomes—in other words, within the normal margin of error for any valuation.

However, many analysts and other practitioners often base their valuations on top-peer multiples. The valuation by parts then easily leads to a conclusion that a company suffers from a so-called conglomerate discount and a recommendation that it should be broken up into parts to unlock the valuation gap versus its peers.

The conclusion is as wrong as the recommendation. The discount simply reflects the fact that compared with its top peers, the company is at a lower valuation level because of lower performance. Splitting up the company does not automatically fix that performance gap (and might not even be needed).

Over the years, practitioners and academics have debated whether a conglomerate or diversification discount exists. In other words, does the market value conglomerates at less than the sum of their parts? Unfortunately, the results are incomplete. There is no consensus about whether diversified firms are valued at a discount relative to a portfolio of pure plays in similar businesses.[9] Some argue that they may even trade at a premium. Among studies that claim a discount, there is no consensus about whether the discount results from the weaker performance of diversified firms relative to more focused firms, or whether the market values diversified firms lower than focused firms.[10] In our experience, however, whenever we have examined a company valued at less than pure-play peers, the company's business units had lower growth and/or returns on capital relative to those peers. In other words, there was a performance discount, not a diversification or conglomerate discount.

[9] P. Berger and E. Ofek, "Diversification's Effect on Firm Value," *Journal of Financial Economics* 37 (1995): 39–65; and B. Villalonga, "Diversification Discount or Premium? New Evidence from Business Information Tracking Series," *Journal of Finance* 59, no. 2 (April 2004): 479–506.

[10] A. Schoar, "Effects of Corporate Diversification on Productivity," *Journal of Finance* 57, no. 6 (2002): 2379–2403; and J. Chevalier, "What Do We Know about Cross-Subsidization? Evidence from the Investment Policies of Merging Firms" (working paper, University of Chicago, July 1999).

SUMMARY

Many large companies have multiple business units, each competing in segments with different economic characteristics. Valuing such companies by parts is standard practice in industry-leading companies and among sophisticated investors because it not only generates better valuation results, but also produces deeper insights into where and how the company is generating value.

To value a company by its parts, you need statements of NOPLAT, invested capital, and free cash flow that approximate what the business units would look like if they were stand-alone companies. In preparing such statements, you likely have to separate out corporate center costs, deal with intercompany transactions, and make a separate equity-cash-flow valuation of any financial subsidiaries. Estimate the weighted average cost of capital for each business unit separately, based on the leverage and the betas of its most relevant peer companies.

To triangulate your DCF estimate, make a multiples-based valuation estimate for each individual unit. Make sure that you use a peer group that closely matches the unit's return on capital and growth. In our experience, conclusions that a corporate group suffers from a so-called conglomerate discount are often the result of selecting a peer group with significantly higher returns on capital and growth.

Part Three

Advanced Valuation Techniques

18

Taxes

In Chapter 9, the company's income statement and balance sheet are reorganized into operating items, nonoperating items, and financing items. Using the reorganized financial statements, we build return on invested capital (ROIC) and free cash flow (FCF), which in turn drive the company's valuation. One complex line item that typically combines all three categories (operating, nonoperating, and financing items) is taxes. Unfortunately, company disclosures rarely provide all the information required to build the operating taxes necessary to project free cash flow. However, you can reverse engineer operating taxes by combining assumptions about marginal tax rates with a clever analysis of the company's tax reconciliation tables.

Once you have computed operating taxes, we recommend converting them from an accrual basis to a cash basis for valuation, because accrual taxes typically do not reflect the cash taxes actually paid. For instance, growing companies with fixed assets tend to pay lower cash taxes than those reported on the income statement, since the government allows accelerated depreciation on new fixed assets. To convert operating taxes to operating cash taxes, adjust operating taxes by the increase in operating deferred-tax liabilities (net of operating tax assets). To ensure that operating cash taxes are independent of nonoperating items, such as taxes related to unfunded pensions, you need to separate deferred taxes into operating and nonoperating categories. Again, company disclosures do not easily lend themselves to determining operating-related deferred-tax assets and liabilities.

Any deferred taxes you classify as operating will flow through cash taxes, net operating profit less adjusted taxes (NOPLAT), and consequently free cash flow (FCF). Deferred taxes classified as nonoperating will not be included in an FCF valuation and therefore must be valued along with their corresponding accounts (as in the case of pensions), valued separately (as in the case of net operating loss carryforwards), or ignored as accounting conventions (as in the case of nondeductible amortization). Regardless of methodology, do not assume that the value of these items equals their book value. Deferred-tax accounts represent past differences between investor and government accounting and not an estimation of the value of future cash flows.

This chapter goes through the steps of estimating operating taxes, converting operating taxes to operating cash taxes, and incorporating deferred taxes into a corporate valuation. We start with the calculation of operating taxes.

OPERATING TAXES ON THE REORGANIZED INCOME STATEMENT

To determine operating taxes, it is necessary to remove the effects of nonoperating and financing items from reported taxes. This can be challenging because of the complexity of tax accounting and the need for data that companies do not typically disclose. We'll introduce a hypothetical company to show several ways to estimate operating taxes, as the best approach may not be possible when you have only the information typically found in an annual report.

Exhibit 18.1 presents the internal financial statements of a global company for a single year. The company generated $2,000 million in domestic earnings before interest, taxes, and amortization (EBITA) and $500 million in EBITA from foreign operations. The company amortizes intangible assets held domestically at $400 million per year. Thus, domestic earnings before interest and taxes (EBIT) are $1,600 million. The company holds debt locally and deducts interest ($600 million) on its domestic statements. It recently sold an asset held in a foreign market and recorded a gain of $50 million. The company pays a statutory (domestic) tax rate of 35 percent on earnings before taxes, but only 20 percent on foreign operations.

EXHIBIT 18.1 **Income Statement by Geography**

$ million

	Domestic subsidiary	Foreign subsidiary	R&D tax credits	One-time credits	Company
EBITA[1]	2,000	500	–	–	2,500
Amortization	(400)	–	–	–	(400)
EBIT[1]	1,600	500	–	–	2,100
Interest expense	(600)	–	–	–	(600)
Gains on asset sales	–	50	–	–	50
Earnings before taxes	1,000	550	–	–	1,550
Taxes	(350)	(110)	40	25	(395)
Net income	650	440	40	25	1,155
Tax rates, %					
Statutory tax rate	35.0	20.0	–	–	–
Effective tax rate	–	–	–	–	25.5

[1] EBITA is earnings before interest, taxes, and amortization; EBIT is earnings before interest and taxes.

EXHIBIT 18.2 **Operating Taxes and NOPLAT by Geography**

$ million

	Domestic subsidiary	Foreign subsidiary	R&D tax credits	One-time credits	Company
EBITA	2,000	500	–	–	2,500
Operating taxes	(700)	(100)	40	–	(760)
NOPLAT[1]	1,300	400	–	–	1,740
Tax rates, %					
Statutory tax rate	35.0	20.0	–	–	–
Operating tax rate	–	–	–	–	30.4

[1] Net operating profit less adjusted taxes.

The company generates $40 million in *ongoing* research and development (R&D) tax credits (credits determined by the amount and location of the company's R&D activities), which are expected to grow as the company grows. It also has $25 million in *one-time* tax credits, in this case a tax rebate related to historical tax disputes. All told, the company pays an effective tax rate on pretax profits of 25.5 percent, well below its statutory domestic rate of 35 percent.[1]

Operating taxes are computed as if the company were financed entirely with equity. Exhibit 18.2 calculates operating taxes and NOPLAT for our hypothetical company. To compute operating taxes, apply the local marginal tax rate to each jurisdiction's EBITA, before any financing or nonoperating items.[2] In this case, apply 35 percent to domestic EBITA of $2,000 million and 20 percent to $500 million in foreign EBITA. Since research and development (R&D) tax credits are related to operations and expected to grow with revenue, they are included in operating taxes as well. The corporation as a whole pays $760 million in operating taxes on EBITA of $2,500 million, resulting in an operating tax rate of 30.4 percent. Note how the operating tax rate does not equal either the statutory tax rate (35 percent) or the effective tax rate from Exhibit 18.1 (25.5 percent).

Computing Operating Taxes Using Public Statements

In practice, companies do not give a full breakout of the income statement by geography, but provide only the corporate income statement and a tax

[1] The effective tax rate, as computed in most annual reports, equals reported taxes divided by earnings before taxes. It will differ from the company's domestic statutory tax rate because foreign income is typically taxed at a rate different from the company's statutory income rate. Differences will also arise because of tax credits unrelated to current income.

[2] The interest tax shield is valuable. Rather than being valued as part of income, however, it is typically valued as part of the weighted average cost of capital (WACC) or separately in adjusted present value. Since amortization is typically nondeductible for tax purposes, it has no value. Therefore, operating taxes are calculated as a function of EBITA, rather than EBIT.

EXHIBIT 18.3 **Income Statement and Tax Reconciliation Table**

Company income statement $ million	
EBITA	2,500
Amortization	(400)
EBIT	2,100
Interest expense	(600)
Gains on asset sales	50
Earnings before taxes	1,550
Taxes	(395)
Net income	1,155

Tax reconciliation table in notes to financial statements, %	
Taxes at statutory rate	35.0
Foreign-income adjustment	(5.3)
R&D tax credits	(2.6)
Audit revision (one-time item)	(1.6)
Effective tax rate	25.5

reconciliation table. Exhibit 18.3 presents the income statement and tax reconciliation table for our hypothetical company. The income statement matches the company-wide income statement in Exhibit 18.1. The tax reconciliation table, which is found in the notes of the annual report, reconciles the taxes reported on the income statement with the taxes that would be paid at the company's domestic statutory rate. For instance, the company paid 5.3 percent ($82.5 million) less in taxes than under the statutory rate of 35 percent because foreign geographies were taxed at only 20 percent.[3] The tax table plays a critical role in determining operating taxes.

The most comprehensive method for computing operating taxes from public data is to begin with reported taxes and undo financing and nonoperating items one by one. In most cases, start by converting the tax reconciliation table from percentages to millions of dollars.[4] To do this, multiply each reported percentage on the tax reconciliation table by "earnings before taxes" found on the income statement. Exhibit 18.4 presents the results when we apply this conversion to a reported tax reconciliation table.[5]

Next, use the dollar-based tax reconciliation table to eliminate one-time and nonoperating taxes from reported taxes. One-time items are excluded for valuation purposes because they have no effect on future tax obligations. Value nonoperating items separately or in conjunction with the corresponding nonoperating asset or liability. Determining what constitutes a one-time or

[3] At a statutory tax rate of 35 percent, a company would pay taxes of $192.5 million on $550 million of income. Our hypothetical company paid only $110 million, a difference of $82.5 million. Dividing $82.5 million by corporate earnings before taxes ($1,550 million) equals 5.3 percent.

[4] Most companies report the tax reconciliation in percentages; however, some companies do report the tax reconciliation table in millions of dollars. In that case, you will need to convert the table into percentages. To do this, divide each currency-denominated line item by earnings before taxes.

[5] Because the tax table is reported only to one decimal place, the reformatted table will only approximate the actual credits. Be careful, as this rounding error can prevent NOPLAT from tying to its reconciliation properly.

EXHIBIT 18.4 **Reformatted Tax Reconciliation Table**

	Tax table, %		Reformatted, $ million
Taxes at statutory rate	35.0	Multiply each account by earnings before taxes = $1,550	543
Foreign-income adjustment	(5.3)		(82)
R&D tax credit	(2.6)		(40)
Audit revision (one-time item)	(1.6)		(25)
Reported taxes	25.5	→	395

EXHIBIT 18.5 **Comprehensive Approach for Estimating Operating Taxes**

$ million

Reported taxes	395	Remove nonoperating taxes found in reconciliation table.
Audit revision (one-time item)	25	
Reported taxes: operating only	420	
Plus: Amortization tax shield (at 35%)	140	Remove taxes related to nonoperating income or expense at appropriate marginal tax rate.
Plus: Interest tax shield (at 35%)	210	
Less: Taxes on gains (at 20%)	(10)	
Operating taxes	760	
Operating tax rate on EBITA, %	30.4	

nonoperating tax requires judgment.[6] Our hypothetical company recently concluded a tax audit with the government for past overpayments. Since the tax credit is not expected to recur, we deem it nonoperating. In Exhibit 18.5, reported taxes of $395 million are adjusted by $25 million to remove the effect of the audit revision. Reported taxes related to operations equal $420 million.

In the final step, adjust reported taxes for each nonoperating item the company reports on its income statement between EBITA and earnings before taxes. In our hypothetical company, the three nonoperating items between EBITA and earnings before taxes are amortization, interest expense, and gains on an asset sale. Since intangibles and debt are held domestically, the amortization tax shield and interest tax shield are computed at 35 percent of the corresponding line item. For instance, the interest tax shield equals $210 million ($600 million × 0.35). Subtract any incremental taxes on nonoperating gains (add taxes related to losses), again at the appropriate marginal tax rate.[7] By applying these

[6]How you classify an item should not affect the valuation. The purpose of proper classification is to improve the quality of benchmarking and the timing of value creation.

[7]If a nonoperating gain or loss on the income statement is not taxed at the statutory rate, the tax reconciliation table will reflect the difference. Be careful not to adjust twice (once from the reconciliation table and again from the nonoperating item at the actual marginal rate).

EXHIBIT 18.6 **Simple Approach for Estimating Operating Taxes**

$ million

Panel A		**Panel B**	
Assumption: Nonoperating items recognized domestically		Assumption: Nonoperating items recognized globally	
Statutory tax rate, %	35.0	Blended global rate, %[1]	29.7
× EBITA	2,500.0	× EBITA	2,500.0
Statutory taxes on EBITA	875.0	Global taxes on EBITA	743
Foreign-income adjustment	(82)		
R&D tax credit	(40)	R&D tax credit	(40)
Estimated operating taxes	753	Estimated operating taxes	702
Estimated operating tax rate, %	30.1	Estimated operating tax rate, %	28.1

[1] Blended global rate equals 35.0% statutory rate minus 5.3% from the foreign-income adjustment.

adjustments to reported operating taxes in Exhibit 18.4, we arrive at an operating tax of $760 million, which matches the operating taxes found in Exhibit 18.2.

This is the most accurate method for computing operating taxes. However, it relies on properly matching each nonoperating item with the appropriate marginal tax rate—a difficult achievement in practice. In some cases, the annual report will provide pretax and posttax nonoperating charges. For instance, in its 2013 10-K, Sierra Wireless reported a gross gain on the sale of its AirCard business of $94 million and a gain net of taxes equal to $70 million, implying that the company was taxed $24 million on the transaction. Since gains are excluded from operating profit, taxes on gains must be removed from reported taxes.

In most cases, however, companies will not explicitly report marginal taxes related to nonoperating items. It therefore becomes necessary to assume the marginal rate for each nonoperating item. We discuss this next.

Computing Operating Taxes: Dealing with Incomplete Data

If marginal tax rates on nonoperating items are not reported (as is usually the case), you will have to make an assumption about the tax jurisdiction in which nonoperating items are held. If you believe the company incurs interest expense and other nonoperating items domestically (typical for companies in countries with high tax rates), multiply the domestic statutory tax rate by EBITA, and then adjust for other operating taxes. In Panel A of Exhibit 18.6, the domestic statutory rate (35 percent) is applied to EBITA ($2,500 million), resulting in statutory taxes on EBITA of $875 million. Using data from the converted tax reconciliation table computed in Exhibit 18.4, subtract the dollar-denominated foreign-income adjustment ($82 million) and the R&D tax credit

($40 million) from statutory taxes on EBITA ($875 million) to determine operating taxes.

The estimate for operating taxes, $753 million, is close but not equal to the $760 million computed using the comprehensive method. The difference is explained by the gains on the asset sales of $50 million that were taxed at 20 percent, not at the statutory rate. Had gains on asset sales been taxed at 35 percent, the two methods would yield identical results.

If you believe the company reports interest expense and other nonoperating items in various geographies proportional to each geography's profits (typical for companies in countries with low tax rates), multiply a blended global rate by EBITA, and adjust for other operating taxes. In Panel B of Exhibit 18.6, a blended global rate of 29.7 percent is applied to $2,500 million in EBITA. The blended global rate is the statutory tax rate (35 percent) adjusted by the foreign-income adjustment (–5.3 percent) found in the company's tax reconciliation table in Exhibit 18.3. Next, work through the reformatted tax reconciliation table for other operating taxes beyond the foreign-income adjustment. For our hypothetical company, subtracting $40 million in R&D tax credits from global taxes on EBITA of $743 million leads to an estimate of $703 million in operating taxes. Once again, estimated operating taxes are not quite equal to actual operating taxes. This is because the majority of nonoperating items actually are recognized domestically, in violation of the assumption that they were distributed across geographies in line with profits.

Be especially cautious when applying a global percentage (Panel B) instead of a dollar-based adjustment (Panel A) when earnings before taxes (EBT) are uncharacteristically small. In 2012, UPS recorded a large pension loss, causing EBT to fall dramatically.[8] As a result, each account in the tax reconciliation table expanded dramatically in size. The foreign-income adjustment, which had been below 1.5 percent, grew to 6.1 percent, only to revert the following year to historical levels. Mistakenly lowering the operating tax rate by 6.1 percentage points in a 2012 forecast would have underestimated the company's likely tax burden, leading to an overestimate of value.

If these two methods lead to incorrect assessments of operating taxes, why use them? Because for most companies, the marginal tax rate on nonoperating items is not disclosed, making the comprehensive method presented in Exhibit 18.5 unusable. In our experience, you are likely to make fewer implementation errors using the simplified method based on an assumption about the provenance of nonoperating items than if you try to use the comprehensive method based on inadequate information. In Chapter 9, we estimated UPS's operating tax rate using the simple approach presented in Panel A of Exhibit 18.6.

[8]The UPS income statement is presented in Exhibit 9.9. The UPS tax reconciliation table is reported in Exhibit 9.11.

Erroneous Alternatives for Computing Operating Taxes

Two alternatives that are incorrect yet common in practice are to use either the company's statutory tax rate or the company's effective rate *with no adjustments.* These shortcuts work for straightforward companies that operate only domestically, but in most other cases they lead to volatile, incorrect estimates of operating taxes.

Computing operating taxes as operating profit multiplied by the company's statutory tax rate typically leads to an upward-biased estimate of operating taxes for U.S.-based companies, because it fails to recognize that foreign earnings are typically taxed at lower levels. For example, the operating tax rate at Hasbro, a toy company with extensive foreign earnings, is consistently below 30 percent, even though the company's statutory rate hovers near 37.5 percent (federal rates plus state rates). In fact, 73 percent of profitable Standard & Poor's (S&P) 500 companies had effective tax rates below the statutory tax rate of 35 percent in 2013.

Alternatively, applying the effective tax rate to operating profit handles foreign earnings properly but does not exclude one-time nonoperating items. This can lead also to incorrect and volatile estimates of operating taxes. For instance, in 2004, the U.S. Congress passed legislation allowing companies to repatriate foreign earnings at a small incremental tax if domestic investments were made. Many companies used this opportunity to repatriate significant earnings, leading to unusually high effective tax rates in 2005. Since this is a one-time tax, it should be evaluated separately and not as part of operating taxes.

CONVERTING OPERATING TAXES TO OPERATING CASH TAXES

In the previous section, we estimated *accrual-based* operating taxes. In actuality, many companies will never pay (or at least will significantly delay paying) accrual-based taxes. Consequently, for estimating taxes on EBITA, you should use a cash tax rate (one based on the operating taxes actually paid in cash to the government), rather than accrual-based taxes.

To convert operating taxes to operating cash taxes, subtract the increase (or add the decrease) in net operating deferred-tax liabilities from accrued operating taxes.[9] The income tax footnote contains the information you need to estimate operating deferred-tax assets and liabilities. Exhibit 18.7 presents the footnote for deferred-tax assets (DTAs) and deferred-tax liabilities (DTLs) for

[9] Given the complexity of today's deferred-tax accounting, applying the raw change in deferred taxes to reported taxes is insufficient for calculating free cash flow. For instance, Coca-Cola reported an increase of $1,287 million in net deferred-tax liabilities ($5,952 million less $4,665 million) in 2013, although it actually deferred only $648 million. The extra increase in net deferred-tax liabilities was primarily caused by an actuarial change to the pension liability.

EXHIBIT 18.7 **Deferred-Tax Assets and Liabilities**

$ million

	Prior year	Current year
Deferred-tax assets (DTAs)[1]		
Tax loss carryforwards	550	600
Warranty reserves	250	300
Deferred-tax assets	800	900
Deferred-tax liabilities (DTLs)		
Accelerated depreciation	(3,600)	(3,800)
Acquired intangibles	(2,200)	(2,050)
Pension and postretirement benefits	(850)	(950)
Deferred-tax liabilities	(6,650)	(6,800)
Deferred-tax assets, net liabilities	(5,850)	(5,900)

[1] Deferred-tax assets are consolidated into a single line item on the balance sheet. If small, they are typically included in other assets.

our hypothetical company. The company has two operating-related deferred-tax accounts:

1. *Warranty reserves (a DTA):* The company records an expense (and takes a tax deduction) for promised warranties when it sells the product. The government recognizes a deductible expense only when a product is repaired, so cash taxes tend to be higher than accrual taxes. With regard to warranty reserves, accrual-based taxes typically understate the actual cash taxes paid.
2. *Accelerated depreciation (a DTL):* The company uses straight-line depreciation for its U.S. Generally Accepted Accounting Principles/International Financial Reporting Standards (GAAP/IFRS) reported statements and accelerated depreciation for its tax returns (because larger depreciation expenses lead to lower pretax income and hence smaller taxes). For a growing company, accelerated depreciation is typically larger than straight-line depreciation, so accrual-based taxes typically overstate the actual cash taxes paid.

In addition, the company has three nonoperating deferred-tax accounts:

1. *Tax loss carryforwards (a DTA):* When a company loses money, it does not receive a cash reimbursement from the government (as negative taxes in the income statement would imply), but rather a credit toward future taxes. Given that past losses are typically unrelated to current profitability, they should not be included as operating. Since tax loss carryforwards are valuable, they must be valued separately.

EXHIBIT 18.8 **Deferred-Tax Asset and Liability Reorganization**

$ million

	Prior year	Current year
Operating DTAs, net of operating DTLs		
Warranty reserves	250	300
Accelerated depreciation	(3,600)	(3,800)
Operating DTAs, net of operating DTLs	(3,350)	(3,500)
Nonoperating DTAs, net of nonoperating DTLs		
Tax loss carryforwards	550	600
Acquired intangibles	(2,200)	(2,050)
Pension and postretirement benefits	(850)	(950)
Nonoperating DTAs, net of DTLs	(2,500)	(2,400)
Deferred tax assets, net of liabilities	(5,850)	(5,900)

2. *Acquired intangibles (a DTL):* When a company buys another company, it recognizes intangible assets on its balance sheet for items such as patents and customer lists.[10] Since these assets are amortized on the income statement but are not deductible for tax purposes, the company will record a DTL during the year of the acquisition and then draw down the DTL as the intangible amortizes. Since operating taxes (computed in Exhibit 18.5) already exclude the amortization tax benefit in calculating NOPLAT, no adjustment is required for deferrals related to these intangible assets. Instead, treat deferred taxes related to amortization of intangibles as nonoperating.
3. *Pension and postretirement benefits (a DTL):* In the United States, the government provides tax relief only when cash contributions are made to pension plans. Thus, deferred taxes arise when reported pension expense differs from cash contributions. Since excess pension assets and underfunded pensions are treated as nonoperating, deferred taxes related to pensions also are nonoperating.

Exhibit 18.8 reorganizes the items in the note about deferred-tax assets and liabilities into operating and nonoperating items. Deferred-tax liabilities (such as those related to accelerated depreciation) are netted against deferred-tax assets (such as those related to warranties). This reorganization makes the components of operating taxes, the reorganized balance sheet, and ultimately the final valuation more transparent and less prone to error.

[10]Under current accounting standards, the premium paid in an acquisition is split between goodwill and other intangible assets (acquired intangibles). Acquired intangibles include identifiable and separable assets like patents, copyrights, product formulas, and customer lists. Unlike goodwill, acquired intangibles are amortized over their estimated lives.

To convert accrual-based operating taxes into operating cash taxes, add the increase in operating DTAs, net of operating DTLs, to operating taxes. In most cases, DTLs will exceed DTAs, so this is equivalent to subtracting the increase in operating DTLs, net of operating DTAs. In Exhibit 18.8, net operating DTLs grow from $3,350 million to $3,500 million, an increase of $150 million. Subtracting the $150 million from operating taxes of $760 million (computed in Exhibit 18.5) gives $610 million of operating cash taxes:

$ million	Current year
Operating taxes	760
Decrease (increase) in net operating DTLs	(150)
Operating cash taxes	610

The operating cash tax rate equals operating cash taxes of $610 million divided by EBITA of $2,500 million (found in Exhibit 18.3), which equals 24.4 percent. Because of the operating deferrals, operating cash taxes are approximately 5 percent lower than operating taxes on an accrual basis. The operating cash tax rate can be applied to forecasts of EBITA when projecting future free cash flow.

DEFERRED TAXES ON THE REORGANIZED BALANCE SHEET

One critical component of a well-structured valuation model is a properly reorganized balance sheet. As outlined in Chapter 9, the accounting balance sheet is reorganized into invested capital, nonoperating items, and sources of financing. Since operating DTAs and DTLs flow through NOPLAT via cash taxes, they are considered equity equivalents. Why equity? When we convert accrual taxes to cash taxes, income is adjusted, and the difference becomes part of retained earnings, making it an equity equivalent.[11]

Exhibit 18.9 presents a reorganized balance sheet that includes the deferred-tax items for the current year from Exhibit 18.8. Equity equivalents, which are located in the equity section, include any accounts used to convert operating taxes to cash operating taxes, in this case, the accelerated depreciation DTL ($3,800 million) net of the warranty reserves DTA ($300 million). Since warranty reserves result in an operating DTA, they are treated as a negative equity equivalent (i.e., a reduction to retained earnings). With the exception of tax loss carryforwards and nondeductible intangibles, classify nonoperating

[11] If mistakenly included as part of invested capital, operating DTAs and DTLs could be double-counted in free cash flow: once in NOPLAT via cash taxes and again when taking the change in invested capital. As discussed in Chapter 9, equity equivalents are not part of invested capital.

EXHIBIT 18.9 **Reorganized Balance Sheet: Treatment of Deferred Taxes**

$ million

Total funds invested: uses		**Total funds invested: sources**	
Operating assets	12,000	Short-term debt	300
Operating liabilities	(3,000)	Long-term debt	1,800
Invested capital without intangibles	9,000	Unfunded pensions	2,200
		Debt and debt equivalents	4,300
Acquired intangibles	8,000		
Less: Gross-up of intangibles (DTLs)	(2,050)	Operating DTLs, net operating DTAs[1]	3,500
Acquired intangibles, adjusted	5,950	Nonoperating DTLs, net nonoperating DTAs[2]	950
		Owners' equity	6,800
Invested capital with intangibles	14,950	Equity and equity equivalents	11,250
Tax loss carry-forwards (DTAs)	600	Total funds invested	15,550
Total funds invested	15,550		

[1] Operating DTLs, net operating DTAs include accelerated depreciation and warranty reserves.
[2] Nonoperating DTLs, net nonoperating DTAs include pension and postretirement benefits.

deferred taxes (e.g., pension and postretirement benefits) as an equity equivalent. Since they do not flow through free cash flow, you will need to value them separately, which we discuss later in the chapter.

Two nonoperating deferred taxes will not be classified as equity equivalents: tax loss carryforwards and deferred taxes related to acquired intangibles. The DTA for tax loss carryforwards ($600 million) shows up as a nonoperating asset and should be valued separately. The deferred-tax liability related to the acquired intangibles ($2,050 million) is treated as an offset to the intangible asset itself, since the asset was grossed up for hypothetical taxes when the asset was created.

Why net deferred taxes for intangible assets against acquired intangibles? When a company buys another company, it typically recognizes intangible assets for intangibles that are separable and identifiable (such as patents). These intangible assets are amortized over their estimated life on the GAAP income statement, but since the amortization is not deductible in most countries for tax purposes, a mismatch will occur. To prepare for this mismatch, the company creates a deferred-tax liability when it makes the acquisition. To keep the balance sheet balanced, the company also increases intangible assets (known in accounting as "grossing up") by the size of the new DTL. Since the grossed-up intangible and deferred-tax liability are purely accounting conventions and do not reflect cash transactions, they should be eliminated.

To apply this offset in Exhibit 18.9, we subtract the deferred-tax liability of $2,050 million from acquired intangibles of $8,000 million, resulting in adjusted intangibles of $5,950 million. By calculating taxes on EBITA and subtracting the DTL from acquired intangibles, we have essentially converted accrual taxes to the cash taxes actually paid.

Finding Deferred Taxes in the Annual Report

One practical difficulty with DTAs and DTLs is finding them. Sometimes they are explicitly listed on the balance sheet, but often they are embedded within other assets and other liabilities. Check the tax footnote for embedded items. For instance, in its 2013 annual report, Coca-Cola describes DTAs and DTLs as follows:

> Noncurrent deferred tax assets of $328 million and $403 million were included in the line item other assets in our consolidated balance sheets as of December 31, 2013 and 2012, respectively. Current deferred tax assets of $211 million and $244 million were included in the line item prepaid expenses and other assets in our consolidated balance sheets as of December 31, 2013 and 2012, respectively. Current deferred tax liabilities of $339 million and $331 million were included in the line item accounts payable and accrued expenses in our consolidated balance sheets as of December 31, 2013 and 2012, respectively.

VALUING DEFERRED TAXES

As noted at the beginning of this chapter, deferred-tax assets and liabilities classified as operating will flow through NOPLAT and free cash flow via cash taxes, and therefore are not valued separately. The remaining nonoperating DTAs and DTLs are either valued as part of the corresponding nonoperating account (as for pensions and convertible bonds), valued separately (as for net operating loss carryforwards), or ignored as an accounting convention (as for intangible assets). For each deferred-tax account, there are four valuation methodologies:

1. *Value as part of NOPLAT and subsequently enterprise value.* Any DTA or DTL used to convert operating taxes into cash operating taxes will flow through free cash flow and subsequently be valued as part of enterprise value. In our hypothetical example, DTAs related to warranties and DTLs related to accelerated depreciation are valued as part of free cash flow.
2. *Value in conjunction with a corresponding nonoperating asset or liability.* The value of DTAs and DTLs related to pensions, convertible debt, and sale/leasebacks should be incorporated into the valuations of their respective accounts. How this is done depends on the nuances of the account. As an example, deferred taxes related to pensions arise when pension expense differs from the cash contribution. But the deferred-tax account recognized on the balance sheet reflects accumulated *historical* differences, not future tax savings. Therefore, to value the tax shield

associated with unfunded pensions, multiply the current unfunded liability by the marginal tax rate (i.e., the expected tax savings attributable to funding the shortfall).[12] Do not use the book value of the deferred-tax account.

3. *Value as a separate nonoperating asset.* When a DTA such as a tax loss carryforward does not have a corresponding balance sheet account like pensions, it must be valued separately. To value tax loss carryforwards, project which years the future tax savings might be realized, and discount those cash flows at the unlevered cost of equity (the cost of debt is too conservative). Be careful to check with local tax experts, since the statutes governing tax loss carryforwards are complex. Also keep in mind that tax loss carryforwards are country specific. A company with tax loss carryforwards in one country cannot use the benefit against profits in another country.
4. *Ignore as an accounting convention.* Some DTLs, such as the kind of nondeductible amortization described earlier in this chapter, arise because of accounting conventions and are not an actual cash liability. These items should be valued at zero.

CLOSING THOUGHTS

Accounting for taxes is complex and can be daunting to even the most seasoned professional. But given the number of companies whose operating tax rates consistently differ from both the statutory tax rate and the effective tax rate, a careful assessment of the operating tax rate is critical to an accurate valuation. If you are confused about a particular line item in the tax reconciliation table, always rely on the general principles of this book by asking two questions: First, is the item ongoing and related to core operations? Second, does the item materially change your perception of the company's performance or valuation? Finally, when converting from operating taxes to cash operating taxes, always assess whether the deferral rate is reasonable and can be continued. Perhaps an acquisition is causing a jump in a deferred-tax account, making the deferral rate uncharacteristically high. If so, use long-term trends to forecast future deferral rates.

[12] Under U.S. law, only cash contributions are deductible, not pension expense. To value pensions, there is no need to value cash contributions. Instead, expected cash contributions should match expected service costs (the economic benefits given to employees) plus current underfunding. Since service cost is part of EBITA, its related tax savings will be part of operating taxes. The remaining items, underfunding and its tax shield, are valued separately.

19

Nonoperating Items, Provisions, and Reserves

To project future cash flows from ongoing operations, you would typically focus on expenses above earnings before interest, taxes, and amortization (EBITA), such as cost of sales, distribution expenses, selling expenses, and administrative expenses. But what about nonoperating expenses, such as business realignment expenses, goodwill impairment, and extraordinary items? Nonoperating expenses are infrequent or unusual charges that are indirectly related to the company's typical activities and not expected to recur. The conventional wisdom is to ignore nonoperating expenses in discounted-cash-flow (DCF) calculations as backward-looking, one-time costs. Yet research shows that the type and accounting treatment of nonoperating expenses can affect future cash flow and in certain situations must be incorporated into your valuation.

In addition to making forecasts more precise, adjustments for nonoperating expenses will also make assessments of past performance more accurate. For instance, before 2009, acquisition premiums attributed to in-process research and development (R&D) for U.S. companies were written off at the time of purchase.[1] This artificially lowered acquired intangibles and retained earnings. To assess historical return on invested capital (ROIC) properly, you need to make adjustments for this type of one-time item.

Typical nonoperating expenses include *amortization* of acquired intangibles, *restructuring charges*, *unusual charges* (such as litigation expense), *asset write-offs*, *goodwill impairments*, and *purchased R&D*. Although interest expense, interest income, and income from noncontrolling interests are nonoperating,

[1] Statement of Financial Accounting Standards (SFAS) No. 141(R), *Business Combinations*, requires that companies recognize acquired in-process R&D as an indefinite-lived intangible asset. Before 2009, companies expensed purchased in-process R&D. SFAS 141(R) brings in-process R&D accounting into line with International Financial Reporting Standards (IFRS) requirements.

they are ongoing. Therefore, analyze interest expense as part of financing (see Chapter 11), and analyze interest income and income from associates in conjunction with the asset that generates the income (see Chapter 12).

For *noncash* nonoperating expenses, such as restructuring charges, a corresponding reserve will be recognized on the balance sheet. This reserve is typically nonoperating and therefore is treated as a debt equivalent. But not every reserve is nonoperating. This chapter outlines a classification system for balance sheet provisions, categorizing them into ongoing operating provisions, long-term operating provisions, nonoperating provisions, and provisions used to smooth income. It describes the process for reorganizing the income statement and balance sheet to reflect the true effect of such provisions, if any, on company value, and shows how to treat them in free cash flow (FCF) and equity valuation.

We begin the chapter by analyzing nonoperating expenses and one-time charges.

NONOPERATING EXPENSES AND ONE-TIME CHARGES

Given their infrequent nature, nonoperating expenses and one-time charges can distort a company's historical financial performance and consequently bias our view of the future. It is therefore critical to separate one-time nonoperating expenses from ongoing operating expenses. The idea sounds simple, but implementation can be tricky. Nonoperating expenses are often spread across the income statement, and some nonoperating expenses are hidden within other accounts and can be discovered only by searching the company's notes. Even after they have been properly identified, the job is not done. Each nonoperating expense must be carefully analyzed to determine its impact on future operations, and, if necessary, forecasts must be adjusted to reflect any information embedded in the expense.

To assess the impact of nonoperating expenses and incorporate their information in cash flow forecasts, we recommend a three-step process:

1. *Separate operating from nonoperating items.* This process requires judgment. As a general rule, treat items that grow in line with revenues and are related to the core business as operating. For line items that are lumpy but only tangentially related to core operations, test the impact of each line item on long-term ROIC.
2. *Search the notes for embedded one-time items.* Not every one-time charge will be disclosed in the consolidated income statement. Sometimes the management discussion and analysis (MD&A) section of the annual report will disclose additional information on one-time items.
3. *Analyze each nonoperating item for its impact on future operations.* Line items not included in EBITA will not be included in free cash flow (FCF),

EXHIBIT 19.1 **Boston Scientific: Income Statement**

$ million

Accounting income statement	2011	2012	2013
Net sales	7,622	7,249	7,143
Cost of products sold	(2,659)	(2,349)	(2,174)
Gross profit	4,963	4,900	4,969
SG&A expense	(2,487)	(2,535)	(2,674)
R&D expense	(895)	(886)	(861)
Royalty expense	(172)	(153)	(140)
Amortization expense	(421)	(395)	(410)
Goodwill impairment charges	(697)	(4,350)	(423)
Intangible-asset impairment charges	(21)	(142)	(53)
Contingent consideration expense	(7)	6	(4)
Restructuring charges	(89)	(136)	(101)
Litigation-related charges	(48)	(192)	(221)
Gain on divestiture	778	15	38
Operating income (loss)	904	(3,868)	120

Reorganized income statement	2011	2012	2013
Net sales	7,622	7,249	7,143
Cost of products sold	(2,659)	(2,349)	(2,174)
Gross profit	4,963	4,900	4,969
SG&A expense	(2,487)	(2,535)	(2,674)
R&D expense	(895)	(886)	(861)
Royalty expense	(172)	(153)	(140)
EBITA	1,409	1,326	1,294
EBITA margin, %	18.5	18.3	18.1

Source: Boston Scientific 2013 annual report.

so they are not part of core operating value. Therefore, it is critical to analyze each nonoperating line item separately and determine whether the charge is likely to continue in the future, in which case it should be incorporated into FCF projections.

Separating Operating from Nonoperating Expenses

Income statements typically include a line item that reads, "Operating income (loss)" or "Operating profit/loss." For example, in Exhibit 19.1, the income statement for Boston Scientific, a medical-equipment manufacturer, shows that in 2013 the company reported an operating profit of $120 million. But is this profit an accurate reflection of the company's long-run earnings potential, especially in light of the previous year's loss? The accounting definition of operating profit differs from our definition of EBITA, in that the accounting standards for classifying items as nonoperating (i.e., to be recorded below operating profit/loss) are extremely strict. To benchmark core operations effectively, however, EBITA and net operating profit less adjusted taxes (NOPLAT) should include only items related to the ongoing core business, regardless of their classification by accounting standards.

Boston Scientific reports several "operating" expenses that are in fact nonoperating. Amortization of intangibles ($410 million in 2013), impairment of goodwill ($423 million), and intangible-asset impairment charges ($53 million) are all noncash reductions in the value of intangible assets; they differ only in their timing and regularity. Other nonoperating expenses include contingent consideration expense ($4 million), restructuring charges ($101 million), litigation-related charges ($221 million), and gains on divestiture ($38 million). For valuation purposes, such nonoperating expenses should not be deducted from revenue to determine EBITA.

The right side of Exhibit 19.1 presents the calculation of EBITA for Boston Scientific. Only operating expenses that grow in line with revenue—such as cost of products sold; selling, general, and administrative (SG&A) expense; research and development (R&D) expense; and royalty expense—are included in the calculation of EBITA. Note how the accounting definition of operating income fluctuates wildly (a gain of $904 million in 2011, a loss of $3,868 million in 2012, and a gain of $120 million in 2013), while EBITA is relatively stable although declining ($1,409 million in 2011, $1,326 million in 2012, and $1,294 million in 2013).

As already noted, classifying items as operating or nonoperating requires judgment. Operating expenses tend to be ongoing and tied to revenue, so a long-term perspective is critical. For instance, treat a plant closure that occurs every 10 years as nonoperating.[2] Conversely, treat a retailer's expenses related to closing stores every year or two years as operating.

For Boston Scientific, we classify royalty payments as operating because royalties are a fundamental part of the medical-devices industry and grow in line with revenue. In contrast, litigation expenses tend to be lumpy and sporadic. Exhibit 19.2 presents ligation expenses for Boston Scientific between 2004 and 2013. The expenses spiked at $780 million in 2005 and $2,022 million in 2009. The company posted a gain related to litigation expenses (a reversal of past charges) in 2010 and has maintained below-average expenses since. We could treat the litigation expenses as operating, but this would artificially depress ROIC in the years the expense was recognized (especially in 2009), rather than in the years when the corresponding benefits were reaped. At the same time, litigation expenses are real, so a valuation of Boston Scientific must incorporate them. Although time-consuming, an analysis of the company's current exposure to litigation and an analysis of average litigation expenses across all medical-technology companies could prove insightful.

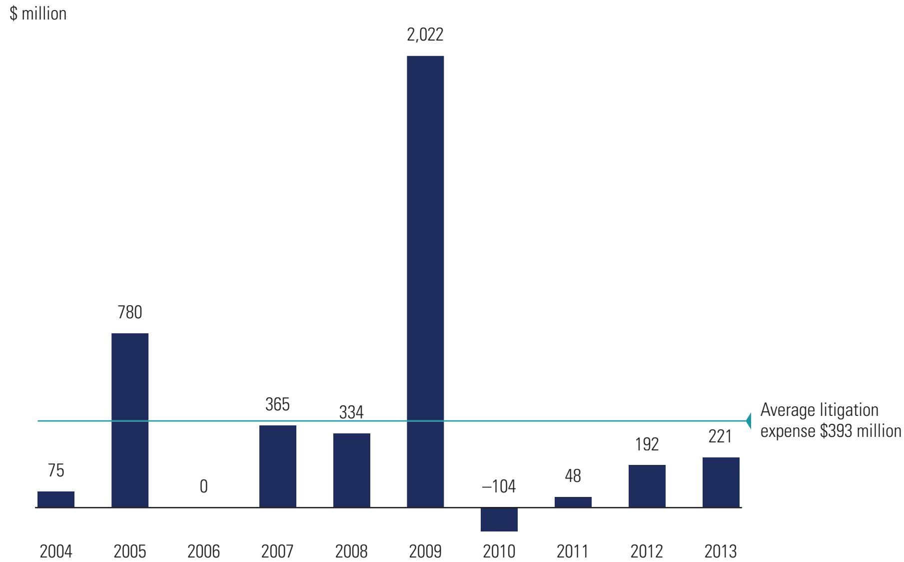
When classification is unclear, measure ROIC with and without the expense. If the expense is lumpy, smooth the expense over the period in which the expense was generated.

Searching the Notes for Hidden One-Time Items

Not every nonoperating expense or one-time charge is explicitly reported in the income statement. Nonoperating expenses and one-time charges can also be embedded in cost of sales or selling expenses. To find embedded expenses,

[2]For example, in 2005, Hasbro took an $18 million charge for a plant closure in Valencia, Spain, its only restructuring charge during the decade. Conversely, during the same time period, Foot Locker closed stores every year.

EXHIBIT 19.2 **Boston Scientific: Litigation Expenses by Year**



Source: Boston Scientific annual reports.

read the management discussion and analysis section in the company's annual report. This section details the changes in cost of sales and other expenses from year to year and will sometimes report unusual items. In 2011, Boston Scientific reported such an expense:

> During the first quarter of 2011, we reversed $20 million of previously established allowances for doubtful accounts against long-outstanding receivables in Greece. During the first quarter of 2011, the Greek government converted these receivables into bonds, which we were able to monetize, reducing our allowance for doubtful accounts as a credit to selling, general and administrative expenses.

Whether you make an adjustment to NOPLAT for such an expense depends on whether the charge is large enough to affect perceptions of performance. If it is not, don't bother. An adjustment could make your analysis overly complex and time-consuming.

Analyzing Each Extraordinary Item for Impact on Future Operations

In Brunswick Corporation's 2013 annual report, the company writes, "The company expects net earnings in 2014 to benefit from restructuring activities completed in 2012 and 2013 as well as lower restructuring, exit and impairment charges, net interest and pension expenses." If credible, such projections should be incorporated into your forecast of future cash flow.

More broadly, academic researchers have been examining the predictive component of special items and one-time charges. Early research pointed to the low persistence of special items, indicating that they are in fact transitory and should not be incorporated into forecasts. However, this early research examined persistence only on a year-to-year basis. In 2009, researchers extended the window to multiple years and found persistence in special items for companies with strong core profits.[3] In other words, a highly profitable company that reports a series of, say, restructuring charges is likely to continue with similar charges in the future. Persistence was low for companies with little operating profit.

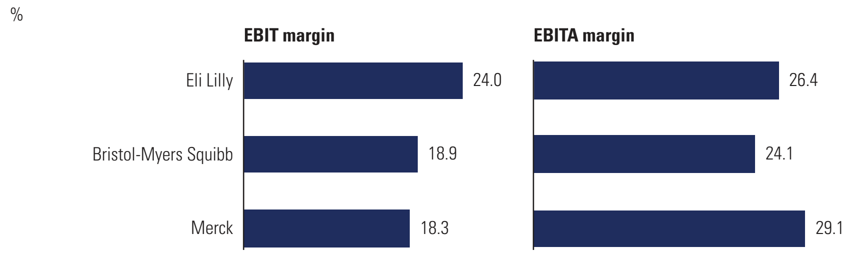
One reason special items may persist year after year for profitable companies is that management may be shifting ongoing operating costs into special items to meet certain earnings targets, as many academic researchers believe they do. This belief also appears common among research analysts, as they decrease their earnings forecasts following the disclosure of a special item.[4] Although the research showing that special items are used to manage earnings is persuasive, it remains unclear how to relate the research results to an individual company. Again, judgment is required: pay close attention to companies disclosing special items. If the special items seem likely to recur, especially in a challenging economy, adjust your forecasts accordingly.

A comprehensive list of nonoperating items and one-time charges is impractical, but the following items are the most common: amortization of acquired intangibles; asset write-offs, including write-offs of goodwill and purchased R&D; restructuring charges; litigation charges; and gains and losses on asset sales. Since each of these nonoperating items requires a particular adjustment, we will work through them one by one.

Amortization of acquired intangibles In 2002, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) changed the previous accounting standards for acquisitions to their current standards, FASB 142 and IFRS 3. The premium paid for acquisitions is no longer classified solely as goodwill, but instead is separated into intangible assets and goodwill. To be classified as an intangible asset, the asset must be separable and identifiable. If it is not, it is classified as goodwill.[5] Goodwill is

[3]P. M. Fairfield, K. A. Kitching, and V. W. Tang, "Are Special Items Informative about Future Profit Margins?" *Review of Accounting Studies* 14, nos. 2–3 (2009): 204–236.
[4]P. K. Chaney, C. E. Hogan, and D. C. Jeter, "The Effect of Reporting Restructuring Charges on Analysts' Forecast Revisions and Errors," *Journal of Accounting and Economics* 27 (1999): 261–284.
[5]For example, patents are considered separable and identifiable, whereas management talent is not. Thus, patents are classified as an intangible asset, while management talent is aggregated with other unidentifiable assets and titled "goodwill." Only intangible assets are amortized.

EXHIBIT 19.3 **EBIT and EBITA Margins in the Pharmaceuticals Industry, 2013**



Source: Annual reports.

tested annually and impaired when the carrying amount of goodwill exceeds its implied fair market value.

Although accounting standards require amortization of acquired intangibles, in most circumstances you should *not* deduct amortization from operating profit to determine NOPLAT. As an alternative to expensing amortization, use EBITA (not EBIT) to determine operating profits. Since amortization is excluded from operating profit, remember to include the cumulative excluded amortization in your total for intangible assets on the balance sheet. A corresponding entry should be made to equity (titled "cumulative amortization") to balance total funds invested.

Why not amortize intangibles, particularly since we include depreciation in our calculation of ROIC? The idea of recognizing an intangible asset and then amortizing its use over a useful life is a good one. Yet current accounting standards do not allow companies to take this approach consistently across all intangibles. Today, only *acquired* intangibles are capitalized and amortized, while *internally generated* intangible assets, such as brand and distribution networks, are expensed when they are created. Thus, the EBIT of a company that acquires an intangible asset and then replenishes the asset through internal investment will be penalized twice on its financial statements, once through selling, general, and administrative (SG&A) expenses and again through amortization. In fact, to expense the creation of new intangible assets while amortizing old intangibles would be tantamount to including both capital expenditures and depreciation on the income statement, a clearly undesirable characteristic. For valuation purposes, avoid mixing amortization and expensing by maintaining goodwill and acquired intangibles at their original values. To do this, compute operating profit before amortization, and add cumulative amortization to the current value of goodwill and intangible assets.

Exhibit 19.3 demonstrates the effect of amortizing acquired intangibles on margins for three companies in the pharmaceuticals industry. Based on EBIT margin, it appears as if Eli Lilly generates the best operating margins of the three companies. This difference, however, can be attributed to the amortization of acquired intangibles. In 2009, Merck acquired Schering-Plough for $41 billion, leading to the recognition of substantial intangible assets and hence significant amortization. Bristol-Myers Squibb also has been an active acquirer, but on a smaller scale. Because Merck's and Bristol-Myers Squibb's EBITs each include investments required to replenish intangible assets (via SG&A) as well as an amortization charge from acquisitions, this double penalty artificially lowers each company's EBIT. Stripping out amortization, Merck generates the highest EBITA margin.

The only situation in which it is appropriate to deduct amortization is when intangibles can be capitalized (versus expensed) consistently. In Chapter 9, we deducted amortization of intangibles related to capitalized software from revenue to determine NOPLAT in our analysis of UPS. We did this because software development costs are capitalized on the balance sheet each year. Thus, EBITA is actually earnings before amortization of acquired intangibles, not all amortization.[6]

Asset write-offs If the value of an asset falls below its book value, accounting standards dictate that the asset should be written down (sometimes entirely) to its fair value. Although write-downs and write-offs give lenders insight into the diminished value of their collateral, the resulting balance sheet value understates the historical investment made by shareholders. Thus, ROIC can artificially rise dramatically following a write-down. To counteract this effect, treat asset write-downs and write-offs as nonoperating, and *add* cumulative write-downs to invested capital. To balance total funds invested, create a corresponding equity equivalent.

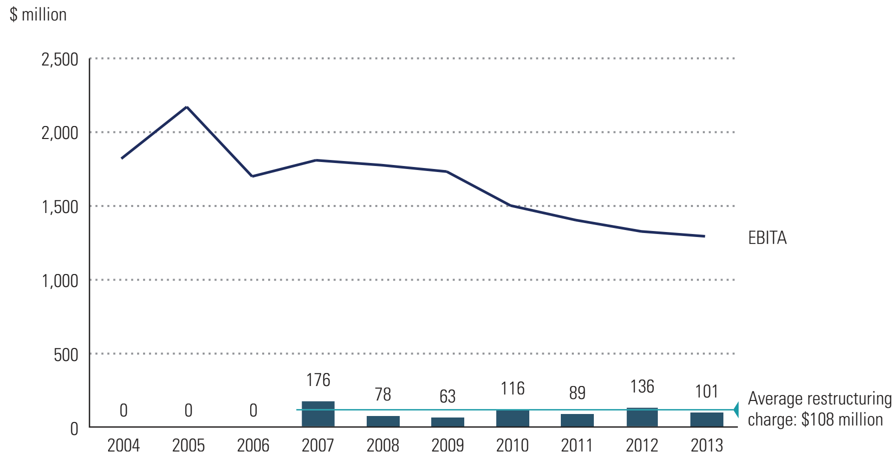
Two categories of asset write-offs are common, and a third is prevalent historically but no longer in effect:

1. *Asset write-offs:* In general, treat an asset write-off as nonoperating. In the rare cases when they occur systematically, treat them as operating. Add back write-downs to the asset, except when you are estimating capital turnover to project future capital needs. In this case, compute the ratio in a manner that best reflects future capital needs.
2. *Goodwill and intangibles impairments:* Treat goodwill and other intangibles impairments as nonoperating, and add back cumulative impairments to goodwill on the balance sheet.[7] Since the purpose of computing

[6]Another example of a company that capitalizes expenses would be one that has no sales force and instead purchases customer contacts from a third party. Since sales outlays are never expensed via SG&A, they must be amortized to arrive at a meaningful measure of operating profitability. Otherwise, the income statement would not accurately reflect the cost of selling expenses.

[7]For a discussion of current accounting standards related to business combinations and goodwill impairment, see the previous section on amortization expense.

EXHIBIT 19.4 **Boston Scientific: EBITA and Restructuring Charges**



Source: Boston Scientific annual reports

ROIC with goodwill is to measure historical performance *including* all past acquisition premiums, goodwill should remain at its original level.

3. *Purchased R&D expenses:* Before 2009, a portion of an acquisition could be written off immediately as purchased R&D. Now that the rule has been eliminated, only significant acquisitions prior to 2009 will require further investigation.

Restructuring charges As business changes, companies must adapt. Major changes often require plant closures, employee layoffs, inventory write-downs, asset write-offs, and other restructuring charges. If a restructuring charge is unlikely to recur, treat the charge as nonoperating. If, however, a pattern of ongoing restructuring charges emerges, further analysis is required. Exhibit 19.4 presents the restructuring charges for Boston Scientific between 2004 and 2013. During this period, Boston Scientific's restructuring charges averaged $108 million per year, or 1.5 percent of revenues. These expenses are reported separately from cost of sales and SG&A.

Given their size and persistence, Boston Scientific's restructuring charges should be analyzed to determine what portion of them represents cash (such as severance payments), whether any cash restructuring charges are likely to continue, and for how long. According to management disclosure in the company's annual report, a major restructuring program was announced in 2007:

> Our Board of Directors approved an expense and head count reduction plan, which we expect will result in the elimination of approximately 2,300 positions worldwide. The plan is intended to bring expenses in line with

> revenues as a part of our initiatives to enhance short- and long-term shareholder value. We expect that the execution of this plan will result in total costs of approximately $425 million to $450 million.

As Exhibit 19.4 shows, Boston Scientific has continued its restructuring program well beyond its expected window, and total restructuring expenses since 2007 have now surpassed $750 million. But will they continue? A lot depends on whether the company's EBITA will continue to decline. For 2014, consensus analyst reports project an uptick in both revenue and EBITA. If this is the case, the restructuring program may finally be wound down.

Many restructuring charges are recorded before any cash is spent. If this is the case, a corresponding reserve will be recorded in the liabilities section of the balance sheet. In the next main section, we consider treatment of various reserves, including those related to restructuring charges.

Litigation charges When there is likely to be a legal judgment against a company, the company will recognize a litigation charge. If the litigation charge recurs frequently and grows with revenue, treat the charge as operating. For instance, most hospital systems frequently defend themselves against malpractice lawsuits. Since these lawsuits are a cost of doing business, the litigation costs should be treated as operating costs for valuation and projected forward. However, if a litigation cost is truly a one-time expense, treat it as nonoperating, and value any claims against the company separately from core operations.

Gains and losses on the sale of assets When an asset's sale price differs from its book value, the company will recognize a gain or loss. Since current gains and losses are backward-looking (value has been created or destroyed in the past), treat them as nonoperating. Additionally, double-check to make sure projected free cash flow will not be distorted by the asset recently sold. For instance, make sure future depreciation reflects only the remaining assets.

Although gains and losses should not be included in operating profit, past asset sales may provide insight about the level of cash to be generated by future asset sales. Again, be careful to value future asset sales (and their corresponding gains and losses) only when the assets are not incorporated in free cash flow. Otherwise, the resulting double-counting will overstate the company's value.

PROVISIONS AND THEIR CORRESPONDING RESERVES

Provisions are noncash expenses that reflect future costs or expected losses. Companies take provisions by reducing current income and setting up a corresponding reserve as a liability (or deducting the amount from the relevant asset).

EXHIBIT 19.5 **Treatment of Provisions and Reserves**

Classification	Examples	Treatment in NOPLAT	Treatment in invested capital	Treatment in valuation
Ongoing operating provisions	Product returns and warranties	Deduct provisions from revenue to determine NOPLAT.	Deduct reserve from operating assets to determine invested capital.	Provision is part of free cash flow.
Long-term operating provisions	Plant decommissioning costs and unfunded retirement plans	Deduct operating portion from revenue to determine NOPLAT, and treat interest portion as nonoperating.	Treat reserve as a debt equivalent.	Deduct reserve's present value from the value of operations.
Nonoperating restructuring provisions	Restructuring charges, such as expected severance payments due to layoffs	Convert accrual provision into cash provision, and treat as nonoperating.	Treat reserve as a debt equivalent.	Deduct reserve's present value from the value of operations.
Income-smoothing provisions	Provisions for the sole purpose of income smoothing	Eliminate provision by converting accrual provision into cash provision.	Treat reserve as an equity equivalent.	Since income-smoothing provisions are noncash, there is no effect.

For the purpose of analyzing and valuing a company, we categorize provisions into one of four types: ongoing operating provisions, long-term operating provisions, nonoperating restructuring provisions, or provisions created for the purpose of smoothing income (transferring income from one period to another). Based on the characteristics of each provision, adjust the financial statements to reflect the company's true operating performance. For example, ongoing operating provisions are treated the same way as any other operating expense, whereas restructuring provisions are converted from an accrual to a cash basis and treated as nonoperating. Exhibit 19.5 summarizes the four types of provisions and how to treat them in NOPLAT, invested capital, and valuation.

Although reclassification leads to better analysis, the way you adjust the financial statements should not affect the company's valuation, because the valuation depends on how and when cash flows through the business, not on accrual-based accounting.

Adjustments for the Provisions

In Exhibit 19.6, we present the abbreviated financial statements for a hypothetical company that recognizes four types of provisions: an environmental provision for decommissioning the company's plant, a provision for future product defects, a provision for smoothing income, and a restructuring provision for future severance payments. In this example we reorganized forecast statements, rather than historical statements, to demonstrate how each type of provision would be treated from a valuation perspective. (Historical

EXHIBIT 19.6 **Provisions and Reserves in the Financial Statements**

$ million

	Today	Year 1	Year 2	Year 3	Year 4
Income statement					
Revenues		1,000.0	1,200.0	1,400.0	1,600.0
Operating costs		(750.0)	(900.0)	(1,190.0)	(1,200.0)
Decommissioning asset, depreciation[1]		(7.7)	(7.7)	(7.7)	–
Decommissioning reserve, accretion[2]		(15.0)	(16.5)	(18.2)	–
Provision for product defects[2]		(100.0)	(120.0)	(140.0)	(160.0)
Income-smoothing provision[2]		(40.0)	(40.0)	80.0	0.0
Operating profit, as reported		87.3	115.8	124.1	240.0
Provision for restructuring		–	(30.0)	–	–
Net Income		87.3	85.8	124.1	240.0
Balance sheet					
Decommissioning asset, gross	77.1	77.1	77.1	77.1	–
Accumulated depreciation	(54.0)	(61.7)	(69.4)	(77.1)	–
Decommissioning asset, net	23.1	15.4	7.7	–	–
Other operating assets	700.0	840.0	980.0	1,120.0	–
Total assets	723.1	855.4	987.7	1,120.0	–
Reserve for decommissioning	150.3	165.3	181.8	–	–
Reserve for product defects	100.0	120.0	140.0	160.0	–
Reserve for restructuring	–	–	30.0	–	–
Reserve for income smoothing	–	40.0	80.0	–	–
Equity	472.9	530.1	555.9	960.0	–
Liabilities and shareholder equity	723.1	855.4	987.7	1,120.0	–

[1] Typically embedded in depreciation and amortization.
[2] Typically embedded in operating costs, such as cost of sales.

statements should be adjusted in the same way as forecast statements.) For simplicity, we assume the company pays no taxes and has no debt.

The process for adjusting the financial statements depends on the type of provision. Exhibit 19.7 shows how to reorganize the income statement and balance sheet for each provision for our hypothetical company. In the following discussion, all numbers in parentheses refer to the year 1 reorganized financial statements.

Provisions related to ongoing operations When a company warranties a product, expects that some products will be returned, or self-insures a service, it must create a corresponding liability when that product or service is sold. If the reserve is related to the ongoing operations, the reserve should be treated the same as other non-interest-bearing liabilities (e.g., accounts payable and wages payable). Specifically, the provision should be deducted from revenues

EXHIBIT 19.7 **ROIC with Provisions and Reserves**

$ million

NOPLAT	**Today**	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Operating profit, as reported		87.3	115.8	124.1	240.0
Decommissioning reserve, accretion		15.0	16.5	18.2	–
Increase (decrease) in income-smoothing reserve		40.0	40.0	(80.0)	–
NOPLAT		142.3	172.3	62.3	240.0
Reconciliation to net income					
Net income		87.3	85.8	124.1	240.0
Decommissioning reserve, accretion		15.0	16.5	18.2	–
Increase (decrease) in income-smoothing reserve		40.0	40.0	(80.0)	–
Provision for restructuring		–	30.0	–	–
NOPLAT		142.3	172.3	62.3	240.0
Invested capital					
Plant decommissioning, net	23.1	15.4	7.7	–	–
Other operating assets	700.0	840.0	980.0	1,120.0	–
Reserve for product defects	(100.0)	(120.0)	(140.0)	(160.0)	–
Invested capital	623.1	735.4	847.7	960.0	–
Reconciliation of invested capital					
Reserve for plant decommissioning	150.3	165.3	181.8	–	–
Reserve for restructuring	–	–	30.0	–	–
Reserve for income smoothing	–	40.0	80.0	–	–
Equity	472.9	530.1	555.9	960.0	–
Invested capital	623.1	735.4	847.7	960.0	–
ROIC on beginning-of-year capital, %	–	22.8	23.4	7.3	25.0

to determine EBITA,[8] and the reserve ($100 million) should be netted against operating assets ($723.1 million) to create invested capital ($623.1 million). Since the provision and reserve are treated as operating items, they appear as part of free cash flow and should not be valued separately.

Long-term operating provisions Sometimes, when a company decommissions a plant, it must pay for cleanup and other costs. Assume our hypothetical company owns a plant that will operate for 10 years and requires $200 million in decommissioning costs. Rather than expense the cash outflow in a lump sum at the time of decommissioning, the company instead records the present value of the cost as both an asset and a liability at the time of investment.[9] In this case,

[8]Since operating provisions are already deducted from revenue in the accounting statements, no adjustment to NOPLAT is required in Exhibit 19.7.

[9]In the United States, asset retirement obligations (AROs) are governed by SFAS 143. Entities covered by IFRS use IAS 37, where the AROs are called "provisions."

EXHIBIT 19.8 **Provisions and Reserves in the Notes**

$ million

	Today	Year 1	Year 2	Year 3
Panel A: Change in the asset account				
Decommissioning asset, starting	30.8	23.1	15.4	7.7
Depreciation	(7.7)	(7.7)	(7.7)	(7.7)
Decommissioning asset, ending	23.1	15.4	7.7	–
Panel B: Change in the liability account				
Decommissioning reserve, starting	136.6	150.3	165.3	181.8
Accretion expense at 10%	13.7	15.0	16.5	18.2
Payout	–	–	–	(200.0)
Decommissioning reserve, ending	150.3	165.3	181.8	–
Panel C: Income statement				
Decommissioning asset, depreciation	7.7	7.7	7.7	–
Decommissioning reserve, accretion	15.0	16.5	18.2	–
Decommissioning expense	22.7	24.2	25.9	–

the 10-year present value of $200 million equals $77.1 million at 10 percent.[10] It's as if the company borrowed $77.1 million and holds the money in restricted cash to fund the future decommissioning outlay.

Once the decommissioning asset and reserve are recognized, the asset is depreciated (similar to the way restricted cash is paid into an outside fund set aside for cleanup), and the reserve is grown (as if the debt accumulates unpaid interest charges). If the decommissioning costs are substantial, as with a nuclear power plant or a mine, the costs will be presented in the company's footnotes. We show a sample note in Exhibit 19.8. In Panel A of Exhibit 19.8, the decommissioning asset declines by $7.7 million each year. This expense is computed using straight-line depreciation on the original decommissioning asset. In Panel B, the decommissioning reserve grows each year by an ever-increasing amount, computed at 10 percent of the prior year's ending reserve. This expense, which mimics interest, is known as accretion. In year 1, the current-year reserve of $150.3 grows by $15.0 million in accretion. The income statement presented in Exhibit 19.6 reports both depreciation and accretion as operating items, often embedded within depreciation and operating costs, respectively.

To estimate NOPLAT, invested capital, ROIC, and FCF, apply the guiding principles presented in Chapter 9. When reorganizing the income statement, treat depreciation as an operating item. Conversely, since accretion mimics

[10]In Exhibit 19.6, the current year represents the seventh year of the plant's expected 10-year life. Consequently, the decommissioning asset and the decommissioning reserve no longer equal their initial value of $77.1 million. Instead, the decommissioning asset has been depreciated seven years to $23.1 million, using straight-line depreciation. Conversely, the decommission reserve grows annually at the discount rate. As a result, the current year reserve equals $77.1 × $(1.10)^7$, which equals $150.3 million.

EXHIBIT 19.9 **FCF with Provisions and Reserves**

$ million

	Today	Year 1	Year 2	Year 3	
NOPLAT	142.3	172.3	62.3	240.0	
Depreciation	7.7	7.7	7.7	–	
Gross cash flow	150.0	180.0	70.0	240.0	
Investment in invested capital	(120.0)	(120.0)	(120.0)	960.0	
Free cash flow	30.0	60.0	(50.0)	1,200.0	Present value at 10% = 858.9
Reconciliation of free cash flow					
Provision for restructuring	–	30.0	–	–	
(Increase) decrease in restructuring reserve	–	(30.0)	30.0	–	
Cash-based restructuring provision	–	–	30.0	–	Present value at 10% = 22.5
Decommissioning reserve, accretion	15.0	16.5	18.2	–	
(Increase) decrease in decommissioning reserve	(15.0)	(16.5)	181.8	–	
Dividends	40.0	70.0	–	1,120.0	
Equity repurchases (issues)	(10.0)	(10.0)	(280.0)	80.0	
Free cash flow	30.0	60.0	(50.0)	1,200.0	

EXHIBIT 19.10 **Enterprise DCF with Provisions and Reserves**

$ million

Valuation		Source
Value of operations	858.9	Summation of discounted cash flow.
Value of restructuring provision	(22.5)	Present value at 10% (debt equivalent).
Reserve for plant decommissioning	(150.3)	Reported as of today (debt equivalent).
Equity value	686.1	

interest, do not include accretion in NOPLAT; instead, include it in the reconciliation to net income, next to interest expense. NOPLAT is computed in the top portion of Exhibit 19.7. To reorganize the balance sheet, classify the decommissioning asset (which is comparable to restricted cash) as part of invested capital and the reserve as a debt equivalent. Invested capital and its reconciliation are presented in the bottom half of Exhibit 19.7. To compute free cash flow, start with NOPLAT, add back depreciation of the decommissioning asset (since it is noncash), and subtract investments in invested capital. Free cash flow is presented in Exhibit 19.9.

When you treat the plant closure reserve as a debt equivalent, the interest expense and reserve drawdown will not flow through free cash flow. Therefore, subtract the current reported reserve ($150.3 million as of today) from the value of operations ($858.9 million) to determine equity value. The value of operations is converted into equity value in Exhibit 19.10.

One-time restructuring provisions When management decides to restructure a company, it will often recognize certain future expenses (e.g., severance payments) immediately. We recommend treating one-time provisions as nonoperating and treating the corresponding reserve as a debt equivalent. In year 2, our hypothetical company declared a $30 million restructuring provision, which will be paid in year 3 (see Exhibit 19.6). Since the restructuring is nonoperating, it is not deducted from revenues to determine NOPLAT. Rather, it is included in the reconciliation to net income (see Exhibit 19.7). Because we plan to value the provision on a cash basis, the noncash reserve is treated as a debt equivalent and is not netted against operating assets to determine invested capital.

Since nonoperating income and expenses do not flow through free cash flow, the restructuring expense must be valued separately on a cash basis. To convert accrual-based restructuring expenses to cash, start with the restructuring expense, and subtract the increase in the restructuring reserve. This leads to a cash-based restructuring provision of $0 in year 1 and $30 million in year 2 (free cash flow and its reconciliation are presented in Exhibit 19.9). The present value of the nonoperating cash flow stream equals $22.5 million, which must be deducted from the value of operations to determine equity value. The value of operations is converted into equity value in Exhibit 19.10.

Income-smoothing provisions In limited cases, companies can use provisions to smooth earnings.[11] For instance, defense contractors will use income smoothing for a particular contract when they believe the contract's value has changed.

In Exhibit 19.6, our hypothetical company was able to show a smooth growth in reported EBITA and net income by using a smoothing provision. We choose a straightforward title for the account, "Income-smoothing provision," but actual companies typically use subtler wording, such as "Other provisions." For our hypothetical company, a provision was recorded in years 1 and 2 and was reversed in year 3. By using an income-smoothing provision, the company hid its year 3 decline in operating performance (operating costs rose from 70 percent to 80 percent of sales).

To evaluate the company's performance properly, eliminate any income-smoothing provisions. Do this by adding the income-smoothing provision back to reported EBITA (essentially undoing the income-smoothing provision). In this way we are converting the provision to cash, rather than accounting for it as an accrual, and subsequently need to treat the reserve as an equity equivalent (using a process identical to the one for deferred taxes). Since income-smoothing provisions are entirely noncash, they don't affect free cash flow or valuation.

[11] Except for limited circumstances, provisions to smooth earnings are not allowed under U.S. GAAP or IFRS. To prevent earnings manipulation, or even the perception of earnings manipulation, many companies will use a third party to estimate key provisions.

Provisions and Taxes

In most situations, provisions are tax deductible only when cash is disbursed, not when the provision is reported. Thus, most provisions will give rise to deferred-tax assets.[12] For operating-related provisions, we recommend using cash, rather than accrual taxes. For nonoperating provisions, estimate the tax impact of the corresponding provision. Do not use book values, as they reflect past accounting and not necessarily future cash flow. For an in-depth discussion of deferred taxes, see Chapter 18.

CLOSING THOUGHTS

The accounting definition of operating profit is quite liberal and will include many one-time and other nonoperating items. Therefore, always start your financial analysis by separating operating from nonoperating items on the income statement. This will create a better picture of the company's performance and its potential for generating future cash flow. In some cases, the proper classification of a particular expense will be unclear. But don't let this ambiguity distract you from the task at hand. A proper valuation will not depend on how the item is treated as long as you include it somewhere and treat it consistently.

[12]For instance, a $30 million noncash restructuring charge would lead to a $30 million restructuring reserve. If the restructuring charge is tax deductible on the GAAP income statement, retained earnings would drop by only $21 million (assuming a 30 percent tax rate). Since the increase in the restructuring reserve does not match the drop in retained earnings, the balance sheet will not balance. To plug the difference, a deferred-tax asset is recognized for $9 million.

20

Leases and Retirement Obligations

In the past, clever use of accounting rules has allowed companies to keep certain assets and debts off their balance sheets. These include leased assets and their corresponding debts, securitized assets like receivables, and unfunded retirement obligations. In some cases companies do this to manage cash flow or take advantage of an alternative route to raise funds. In other cases off-balance-sheet items are used to artificially boost traditional metrics such as earnings per share or return on assets.

In response to the accounting scandals of the early 2000s and the financial crisis of 2007–2009, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) have made significant changes to their guidelines. These changes have brought accounting rules closer to the economic principles outlined in this book, but many gaps still exist. Thus, even under recent changes, an accurate valuation still requires adjustments to the income statement and balance sheet. This chapter outlines the process for analyzing and valuing companies with substantial operating leases, securitized receivables, and unfunded retirement obligations.

OPERATING LEASES

When a company borrows money to purchase an asset, the asset and debt are recorded on the company's balance sheet, and interest is deducted from operating profit to determine net income. If, instead, the company leases that same asset from another organization (the lessor) and the lease meets certain criteria, the company (or lessee) records only the periodic rental expense associated with the lease.[1] Therefore, a company that chooses to lease its assets will have

[1]Statement of Financial Accounting Standards (SFAS) 13 details certain situations when leases must be capitalized (the asset and associated debt must be recorded on the balance sheet). For example, if

artificially low *operating* profits (because rental expenses include an implicit interest expense) and artificially high capital productivity (because the assets do not appear on the lessee's balance sheet). Although these two effects counteract each other, the net effect is an artificial boost in return on invested capital (ROIC), because the reduction in operating profit by rental expense is typically smaller than the reduction in invested capital caused by omitting assets. The result is especially dramatic for profitable companies that lease a substantial portion of their fixed assets, as is typical of retailers and airlines.

This section outlines how to adjust the financial statements and valuation to reflect the real economics of operating leases. Adjusting the financial statement makes return on capital and free cash flow once again independent of capital structure choices, specifically whether to lease, own, or borrow. Although ROIC and leverage ratios will change following the adjustment, the company's valuation should not. A drop in ROIC will be accompanied by a corresponding drop in the cost of capital and increase in debt equivalents. The net effect will leave the equity valuation unchanged, as shown in Chapter 8.

The process for adjusting financial statements and valuation for operating leases consists of three steps:

1. Capitalize the value of leased assets on the balance sheet, and make a corresponding adjustment to long-term debt. Adjust earnings before interest, taxes, and amortization (EBITA) upward by removing the implicit interest in rental expense.
2. Estimate a weighted average cost of capital (WACC) that reflects the adjusted debt to enterprise value that includes capitalized operating leases as debt.
3. Value the enterprise by discounting free cash flow (based on the newly reorganized financial statements) at the adjusted WACC. Subtract traditional debt and the value of operating leases from enterprise value to determine equity value.

Use judgment about when to adjust the financial statements for leases. Many companies have relatively modest lease obligations, relative to the size of the company, or rent assets for short periods of time (say, less than two years) to maintain flexibility. In these situations, the complexity of adjusting the financial statements and WACC outweighs the benefits of more accurate ROIC and will not improve your understanding of the company's performance and value drivers.

the asset is transferred to the lessee at the end of the lease, the lease must be capitalized. At the time of this writing, a joint task force of the FASB and the IASB is examining whether all leases should be capitalized.

EXHIBIT 20.1 **Leasing Example: Financial Statements**

$ million

Income statement

	Today	Year 1	Year 2	Year 3
Revenues	900.0	1,000.0	1,150.0	1,265.0
Expenses	–	(800.0)	(920.0)	(1,012.0)
Rental expense	–	(106.4)	(115.4)	(118.1)
EBITA	–	93.6	114.6	134.9
Interest	–	(7.1)	(7.7)	(7.9)
Earnings before taxes	–	86.5	106.9	127.0
Taxes	–	(21.6)	(26.7)	(31.7)
Net income	–	64.9	80.2	95.2
Supplemental disclosure				
Rental expense	n/a	106.4	115.4	118.1
Value of operating leases[1]	710.6	769.2	787.8	–

Balance sheet

	Today	Year 1	Year 2	Year 3
Short-term assets	360.0	400.0	345.0	–
Long-term assets	189.4	230.8	362.2	–
Operating assets	549.4	630.8	707.2	–
Operating liabilities	180.0	200.0	230.0	–
Debt	118.4	128.2	131.3	–
Equity	251.0	302.6	345.9	–
Liabilities and equity	549.4	630.8	707.2	–

[1] The value of operating leases is not typically disclosed. A method for estimating the value of leased assets is presented later in this chapter.

Adjusting for Operating Leases: An Example

Exhibit 20.1 presents the financial statements of a hypothetical company. To avoid the complexities of continuing value, we assume the company liquidates in the final year. Debt is retired, and a liquidating dividend is paid.

A significant portion of the company's assets, $710.6 million, is leased.[2] Since the leases are classified as operating leases, the leased assets are not included on the company's balance sheet, which reports only $549.4 million in operating assets. Instead, the company reports $106.4 million in rental expenses in year 1. Typically, rental expense is not explicitly shown as a separate line item on the income statement, but instead is disclosed in the company's footnotes.

The value of operating leases is also shown in Exhibit 20.1. Under current accounting standards, the actual value of leased assets is typically not disclosed, but there are various methods for estimating the value of leased assets, which we outline later in the chapter. For the purpose of this adjustment example, we assume the value of the leased assets has already been estimated.

Reorganizing the financial statements to reflect operating leases Exhibits 20.2 and 20.3 show how to adjust the financial statements to reflect operating leases. On the left side of each exhibit, the financial statements are reorganized

[2] To highlight the adjustments for operating leases, we assume that a significant portion of the assets is leased. Although significant leases are common in airlines and retail, most industries use operating leases in moderation.

EXHIBIT 20.2 **Leasing Example: NOPLAT Calculation**

$ million

NOPLAT (direct from financial statements)

	Year 1	Year 2	Year 3
Revenues	1,000.0	1,150.0	1,265.0
Operating expenses	(800.0)	(920.0)	(1,012.0)
Rental expense	(106.4)	(115.4)	(118.1)
EBITA	93.6	114.6	134.9
Operating taxes	(23.4)	(28.7)	(33.7)
NOPLAT	70.2	86.0	101.1
Reconciliation			
Net income	64.9	80.2	95.2
After-tax interest expense	5.3	5.8	5.9
NOPLAT	70.2	86.0	101.1
ROIC (on beginning-of-year capital, %)	19.0	20.0	21.2

NOPLAT (adjusted for leases)

	Year 1	Year 2	Year 3
Revenues	1,000.0	1,150.0	1,265.0
Operating expenses	(800.0)	(920.0)	(1,012.0)
Lease depreciation	(70.9)	(76.9)	(78.8)
EBITA	129.1	153.1	174.3
Operating taxes	(32.3)	(38.3)	(43.6)
NOPLAT	96.8	114.8	130.7
Reconciliation			
Net income	64.9	80.2	95.2
After-tax interest expense	5.3	5.8	5.9
After-tax lease interest	26.6	28.8	29.5
NOPLAT	96.8	114.8	130.7
ROIC (on beginning-of-year capital, %)	9.0	9.6	10.3

without an adjustment for operating leases; on the right side, the reorganized financial statements reflect adjustments for leases. To assure consistency, net operating profit less adjusted taxes (NOPLAT) is reconciled to net income, and invested capital is computed from both sources and uses of invested capital. The adjustments are as follows.

To calculate NOPLAT, as shown in Exhibit 20.2, increase EBITA by the implicit lease interest expense, and then apply the operating tax rate. To estimate implicit interest, multiply the value of operating leases ($710.6 million in year 1) by the cost of secured debt, assumed to be 5 percent.[3] As a result, EBITA rises by $35.5 million, from $93.6 million to $129.1 million. The remaining rental expense of $70.9 million is renamed lease depreciation (the other major component of rental expense). Since depreciation is not related to capital structure, it remains as an operating expense. To calculate invested capital, as shown in Exhibit 20.3, add the value of capitalized operating leases ($710.6 million) to book assets and to long-term debt. Invested capital rises from $369.4 million to $1,080.0 million in the current year.

To compute ROIC adjusted for operating leases, shown at the bottom of Exhibit 20.2, divide adjusted NOPLAT by invested capital including leases. Note that the adjustments to the financial statements cause ROIC to drop from 19.0 percent to 9.0 percent in year 1. What appeared to be the creation of above-average returns is merely an artifact of off-balance-sheet leverage.

[3]The value of operating leases is presented in the supplemental disclosure of Exhibit 20.1. The process for estimating the value is discussed later in this section. As a proxy for the cost of secured debt, you can use the yield to maturity on AA-rated 10-year bonds.

EXHIBIT 20.3 **Leasing Example: Invested Capital Calculation**

$ million

Invested capital (direct from financial statements)

	Today	Year 1	Year 2	Year 3
Operating assets	549.4	630.8	707.2	–
Operating liabilities	(180.0)	(200.0)	(230.0)	–
Invested capital	369.4	430.8	477.2	–
Reconciliation				
Debt	118.4	128.2	131.3	–
Equity	251.0	302.6	345.9	–
Invested capital	369.4	430.8	477.2	–

Invested capital (adjusted for leases)

	Today	Year 1	Year 2	Year 3
Operating assets	549.4	630.8	707.2	–
Capitalized operating leases	710.6	769.2	787.8	–
Adjusted operating assets	1,260.0	1,400.0	1,495.0	–
Operating liabilities	(180.0)	(200.0)	(230.0)	–
Invested capital	1,080.0	1,200.0	1,265.0	–
Reconciliation				
Debt	118.4	128.2	131.3	–
Capitalized operating leases	710.6	769.2	787.8	–
Equity	251.0	302.6	345.9	–
Invested capital	1,080.0	1,200.0	1,265.0	–

Building a cost of capital that reflects adjusted debt to enterprise value Although the return on capital drops when leases are capitalized, this does not necessarily mean the company is destroying value. The cost of capital must be adjusted for operating leases as well, and it will drop after adjustment.

To determine the cost of capital, we start by computing how the company is financed. Exhibit 20.4 presents the raw (unadjusted) and adjusted capital structure for our leasing example. To determine the raw enterprise value, sum the value of debt ($118.4 million) and the market value of equity ($355.3 million) for a total enterprise value of $473.7 million. On a raw basis, debt makes up 25 percent of enterprise value, and equity value makes up 75 percent of enterprise value. To adjust the capital structure for operating leases, add the value of operating leases ($710.6 million) to the raw enterprise value for an adjusted enterprise value of $1,184.3 million. On an adjusted basis, debt and capitalized operating leases make up 70 percent of enterprise value, and

EXHIBIT 20.4 **Leasing Example: Current Capital Structure**

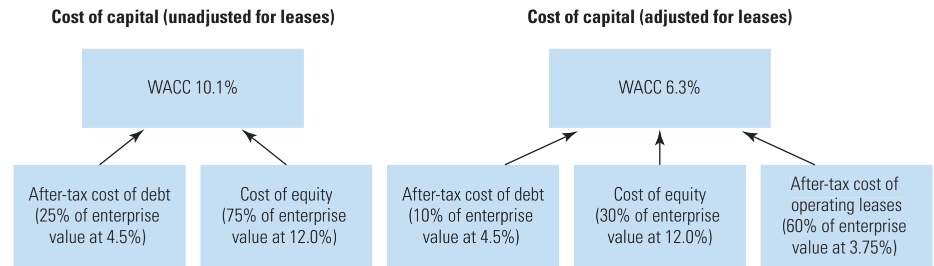
Capital structure (unadjusted for leases)

	$ million	% of enterprise value
Debt value	118.4	25.0
Market value of equity	355.3	75.0
Enterprise value	473.7	100.0

Capital structure (adjusted for leases)

	$ million	% of enterprise value
Debt value	118.4	10.0
Value of operating leases	710.6	60.0
Market value of equity	355.3	30.0
Enterprise value	1,184.3	100.0

EXHIBIT 20.5 **Leasing Example: Weighted Average Cost of Capital (WACC) Calculation**



equity makes up 30 percent of enterprise value, a significant shift in perceived leverage.

Exhibit 20.5 presents the cost of capital adjusted and unadjusted for operating leases. The unadjusted weighted average cost of capital is 10.1 percent based on an assumed after-tax cost of debt of 4.5 percent and assumed cost of equity of 12 percent. The adjusted WACC is 6.3 percent because of the change in the debt-to-equity ratio. In the calculations for this example, the cost of equity was given at 12 percent. In practice, the cost of equity must be estimated using beta. Following the principles of Chapter 13, start by estimating an industry unlevered beta. If leases are common to the industry, unlever each company's beta using a debt-to-equity ratio adjusted for operating leases. Next, to determine the target company's beta, relever the unlevered beta to the target company's capital structure inclusive of leases. Alternatively, if you choose to unlever without the effect of operating leases—which can be a laborious process—then relever the industry beta using the unadjusted capital structure. Regardless of your choice, maintain consistency between the levering and unlevering process. Once a levered beta is chosen, use this beta for both the unadjusted and adjusted cost of equity. The choice of accounting method should not affect the risks faced by equity holders. Therefore, the cost of equity should not be affected by the choice of model.

Valuing the enterprise with operating leases To value the company, use the reorganized financial statements to compute discounted free cash flow, as shown in Exhibit 20.6. The left side shows free cash flow computed without adjustment for operating leases, and the right side adjusts free cash flow for operating leases. Note that free cash flow depends on the accounting treatment of off-balance-sheet financing, but the company's equity value does not.

To build adjusted free cash flow, do not add lease depreciation back to NOPLAT to compute gross cash flow. Although depreciation is a noncash charge for the lessor, it is a cash charge for the lessee. Year-to-year changes in operating leases are part of adjusted invested capital, so they are part of free cash flow. Although NOPLAT is consistently higher after adjustments for

EXHIBIT 20.6 **Leasing Example: Free Cash Flow and Equity Valuation**

$ million

Free cash flow (unadjusted for leases)

	Year 1	Year 2	Year 3
NOPLAT	70.2	86.0	101.1
(Increase) decrease in invested capital	(61.3)	(46.4)	477.2
Free cash flow	8.9	39.5	578.4
Reconciliation			
Interest expense	7.1	7.7	7.9
Interest tax shield	(1.8)	(1.9)	(2.0)
Cash flows to debt	(9.8)	(3.1)	131.3
Cash flows to equity	13.3	36.9	441.2
Reconciliation of free cash flow	8.9	39.5	578.4
Discount factor	0.908	0.825	0.749
Discounted cash flow	8.0	32.6	433.1
Valuation			
Enterprise value	473.7		
Debt	(118.4)		
Equity value	355.3		

Free cash flow (adjusted for leases)

	Year 1	Year 2	Year 3
NOPLAT	96.8	114.8	130.7
(Increase) decrease in invested capital	(120.0)	(65.0)	1,265.0
Free cash flow	(23.2)	49.8	1,395.7
Reconciliation			
Interest expense	7.1	7.7	7.9
Lease interest expense	35.5	38.5	39.4
Interest tax shield	(10.7)	(11.5)	(11.8)
Cash flows to debt	(9.8)	(3.1)	131.3
Cash flows to lease debt	(58.7)	(18.6)	787.8
Cash flows to equity	13.3	36.9	441.2
Reconciliation of free cash flow	(23.2)	49.8	1,395.7
Discount factor	0.941	0.885	0.833
Discounted cash flow	(21.8)	44.1	1,162.0
Valuation			
Enterprise value	1,184.3		
Debt	(118.4)		
Operating leases	(710.6)		
Equity value	355.3		

leases, free cash flow is not. This is because free cash flow is a function of NOPLAT (which is higher) less capital investments (which are often higher as well). Do not include lease interest (an outflow of $35.5 million in year 1) and the change in lease obligations (an inflow of $58.7 million) as part of free cash flow; they are sources of financing.

To value the enterprise, discount free cash flow at the appropriate cost of capital, derived in Exhibit 20.5: 10.1 percent for unadjusted free cash flow and 6.3 percent for lease-adjusted free cash flow. To convert enterprise value to equity value, subtract today's value of debt ($118.4 million) and lease obligations ($710.6 million) from enterprise value. As shown in Exhibit 20.6, the equity value ($355.3 million) is unchanged when the financial statements are adjusted for operating leases.

Since valuation is not affected by the treatment of operating leases, you may wonder why it is worth the effort to adjust the financial statements. The answer is that capitalizing operating leases is a critical step in competitive benchmarking. Companies that use more operating leases will have higher raw ROICs, leading to misperceptions of their relative performance. Thus, even if you choose not to adjust the valuation for operating leases because this will not affect your final figures, always benchmark performance with adjusted numbers.

Estimating the Value of Leased Assets

Companies seldom disclose the value of their leased assets, but you need to estimate their value to adjust for operating leases. We recommend the following estimation process using rental expense, the cost of secured debt, and an estimated asset life. To see why, examine the determinants of rental expense. To compensate the lessor properly, the rental expense includes compensation for the cost of financing the asset (at the cost of secured debt, denoted by k_d in the following equations) and the periodic depreciation of the asset (for which we assume straight-line depreciation). The following equation solves for periodic rental expense:

$$\text{Rental Expense}_t = \text{Asset Value}_{t-1}\left(k_d + \frac{1}{\text{Asset Life}}\right) \tag{20.1}$$

To estimate the asset's value, rearrange equation 20.1 as follows:

$$\text{Asset Value}_{t-1} = \frac{\text{Rental Expense}_t}{\left(k_d + \frac{1}{\text{Asset Life}}\right)} \tag{20.2}$$

Rental expense is disclosed in the footnotes, and the cost of debt can be estimated using AA-rated yields. (Remember, the operating lease is secured by the underlying asset, so it is less risky than the company's unsecured debt.) This leaves only the asset life, which is unreported. To estimate asset life, Lim, Mann, and Mihov propose using property, plant, and equipment (PP&E) divided by annual depreciation. In their research, they examined 7,000 firms over 20 years and computed the median asset life at 10.9 years.[4]

Many in the investment banking community multiply rental expenses by 8 times to approximate asset value, rather than using the formula in equation 20.2. Although this method is quite simple, the multiplier is based on reasonable assumptions: using the depreciation-adjusted perpetuity from equation 20.2 with a cost of debt of 6 percent and an asset life of 15 years leads to a multiplier of 8 times.[5] But be careful. As the cost of debt or asset life deviates from these values, the 8-times multiplier could lead to incorrect assessments.

[4] S. C. Lim, S. C. Mann, and V. T. Mihov, "Market Evaluation of Off–Balance Sheet Financing: You Can Run but You Can't Hide" (EFMA 2004 Basel Meetings paper, European Financial Management Association, December 1, 2003).

[5] Asset value equals rental expense times a capitalization rate, such that the capitalization rate equals 1 divided by the sum of the cost of debt and 1 divided by the asset life. If the cost of debt is 0.06 and 1 divided by the asset life equals 0.067 (i.e., 1/15), the capitalization rate equals 7.9.

Research on Operating Leases as a Form of Debt

To analyze our hypothetical company, we treated off-balance-sheet leases no differently than traditional debt. But is this the practice of investors, lenders, and the rating agencies? To address this question, researchers have examined the use of off-balance-sheet leases and their effects on credit ratings and interest rates.

In their study of operating leases, Lim, Mann, and Mihov examined the effect of operating leases on debt ratings and bond yield premiums for 7,000 companies over 20 years.[6] They found that when companies used more operating leases, rating agencies in fact awarded them lower credit ratings. These ratings and the use of operating leases subsequently led to higher required yields on issuances of new public bonds. In a second study, researchers at Ohio State University examined more than 2,500 bank loans to test whether credit statistics adjusted for operating leases explained the interest rates charged better than unadjusted statistics did.[7] They found that interest rates for unrated, unsecured debt were indeed explained better by credit statistics adjusted for operating leases. The evidence is clear. Investors, lenders, and rating agencies all treat operating leases the same as traditional debt. Thus, a thoughtful financial analysis will adjust the financial statements for operating leases.

Proposed Changes to the Accounting for Operating Leases

In August 2010, the FASB and IASB issued an exposure draft proposing the capitalization of operating leases that would make the adjustments in this section necessary for historical benchmarking only. Reaction to the proposal was mixed. Consequently, two revised proposals were issued in 2013 and 2014. At the time of this writing, no final action on them has been taken. Even if a proposal is accepted, adjustments most likely will still be required.

Most proposals have recommended using the present value of required lease payments, which can be found in the company's footnotes. Although this method is used by rating agencies such as Standard & Poor's, it systematically undervalues the asset, since it ignores the residual value returned at the end of the lease contract. For example, most would agree that a $1 million asset leased for two years is worth more than the present value of two payments of $100,000 per year.

If companies use the present value of lease obligations to value their operating leases, the adjustments outlined still hold, but the size of leases must be reduced by the portion already capitalized.

[6]Lim et al., "Market Evaluation of Off-Balance Sheet Financing."
[7]J. L. M. Altamuro, R. M. Johnston, S. Pandit, and H. Zhang, "Operating Leases and Credit Assessments" (Ohio State University working paper, April 2008).

SECURITIZED RECEIVABLES

Before the financial crisis of 2007–2009, many companies sold their accounts receivable prior to collection. Under the liberal accounting policies of the time, receivables sold could be removed from the balance sheet, leading to better operating cash flow and higher ROIC. But the improved accounting metrics were misleading. In reality, the company pays a fee for the arrangement, reduces its borrowing capacity, and pays higher interest rates on unsecured debt—all characteristics of raising traditional debt.

In the wake of the financial crisis, accounting policy has tightened.[8] In many cases, securitized receivables are now classified as secured borrowing. In these situations, no adjustment is required. In the infrequent cases where securitized receivables are not capitalized on the balance sheet, add back the outstanding amount of securitized receivables to the balance sheet and make a corresponding increase to short-term debt. Any fees paid for securitizing receivables should be treated as interest.

One company that securitizes receivables is Crown Holdings. In 2013, the company had $233 million outstanding at year-end in securitized receivables facilities, but since these were classified as secured borrowing, no adjustment is necessary. During the year, the company also sold $348 million of receivables, which were classified as sold. Assuming the receivables were sold evenly throughout the year and receivables remain uncollected for a month, you would increase accounts receivable and short-term debt by $29 million.

With bank credit becoming more expensive and accounting policy tightening, many companies have discontinued their receivables securitization programs.[9] Nonetheless, securitization programs still exist, so keep a watchful eye on the footnotes to the financial statements.

PENSIONS AND OTHER RETIREMENT BENEFITS

Many companies still promise retirement benefits to their employees. Often, companies set aside investments in a separate trust to fund future obligations. If future obligations are greater than the value of investments held, the company will have unfunded retirement obligations. Funding practices vary across countries, mostly because of differences in taxes and regulations related to pensions. In Germany, for example, companies are not required to prefund pension obligations and receive no tax deductions for early funding, so companies do not fund their pension obligations and unfunded liabilities are quite large. In

[8] For more on securitization accounting, see FASB Accounting Standards Codification Topic 860, Transfers and Servicing.

[9] For example, Hasbro stopped drawing on its receivables securitization facility in 2008, and Union Pacific stopped in 2010. Conversely, Sprint announced in May 2014 that it had entered into a facility agreement of up to $1.3 billion with the Bank of Tokyo–Mitsubishi.

contrast, the United States requires prefunding for corporate pension plans, but since the amount of the investment fund rarely equals the exact present value of the liabilities, companies will typically report an under- or overfunded pension account, either of which can be quite large. Not all retiree benefits in the United States require prefunding. For instance, there is no prefunding requirement for promised medical benefits, which can exceed billions of dollars. Advanced funding is not tax deductible, so companies rarely prefund these obligations.

Accounting rules related to pensions and other retiree benefits have changed significantly over the past 75 years.[10] Originally, companies were not required to record unfunded liabilities on their balance sheets. Starting in 1956, Accounting Research Bulletin 47 required unfunded liabilities be recognized on the balance sheet. Rather than use the market value of underfunding, however, underfunding was recognized only gradually, in order to smooth the effects on the income statement and balance sheet. In 2006, another major shift occurred, and today companies must immediately recognize the market value of all unfunded retirement-related obligations (and excess assets) on the balance sheet.[11] Unfortunately, the 2006 changes did not address the complex way pension accounting can distort operating profitability.

Under current accounting rules in the United States, all items related to the change in pensions, including interest expense and gain or loss on investments, are included as an operating expense and therefore are embedded in line items such as cost of goods sold and selling, general, and administrative (SG&A) expenses. However, including these items distorts operating performance, especially when the pension fund is large. In contrast, International Accounting Standards (IAS) are more restrictive, treating only current service costs, past service costs, and administrative expenses as operating expenses. Therefore, the distortion will be much smaller.

This section outlines how to incorporate unfunded retirement liabilities (or excess retirement assets) into a company's value and how to adjust the income statement to eliminate accounting distortions. The process is as follows:

1. *Invested capital.* Identify unfunded liabilities and excess pension assets on the balance sheet.[12] If the company does not separate pension accounts, search the pension footnote for their location. Excess pension assets should be treated as nonoperating, and unfunded pension liabilities should be treated as a debt equivalent.

[10] For more on the history of pension accounting, see B. W. Carpenter and D. P. Mahoney, "Accounting for Defined Benefit Pension Plans: Is FASB Finally Fulfilling Its 25 Year Old Promise?" *Journal of Business and Economics Research* 5, no. 8 (August 2007): 79–90.

[11] Financial Reporting Standard (FRS) 17 was implemented by the British Financial Reporting Council in 2000. SFAS 158 was passed in 2006 by U.S.-based FASB, and IAS 19 is under continual revision by the IASB.

[12] Since not every company reports prepaid pension assets and unfunded pension liabilities as separate line items, do not assume pensions are fully funded if no line item appears on the balance sheet.

2. *NOPLAT.* To accurately reflect the economic expenses of pension benefits given to employees, remove the accounting pension expense from cost of sales, and replace it with the service cost and, if benchmarking, amortization of prior service costs. The pension expense, service cost, and amortization of prior service costs are reported in the company's notes.[13]
3. *Value.* Add excess pension assets to and deduct unfunded retirement liabilities from enterprise value. Valuations should be done on an after-tax basis, using local tax rules.

Analyzing and Valuing Pensions: DuPont Example

To demonstrate the proper treatment of pensions and other postretirement benefits, we examine the accounts of the global chemicals company DuPont.[14] To measure the effect of pensions on DuPont's performance and enterprise value, we use data from note 18, Long-Term Employee Benefits, in DuPont's 2013 annual report. In the note, the company separates defined benefits into pension and other benefits (mostly retiree medical benefits), both of which are underfunded.

Identifying excess pension assets and unfunded pension liabilities on the balance sheet Not every company reports prepaid pension assets and unfunded pension liabilities as a separate line item. Many companies consolidate prepaid pension assets in other long-term assets and treat unfunded pension liabilities as part of other long-term liabilities, making them difficult to identify. In the pension footnote, the company typically reports the location of any excess pension assets and unfunded liabilities on the balance sheet.

Exhibit 20.7 reports the funded status of DuPont's defined-benefit plans and the location of the company's underfunding on the balance sheet. In 2013, DuPont had unfunded pension liabilities of $5,675 million and $2,754 million in unfunded medical and other benefits, the majority of which were included in other liabilities on its balance sheet.[15] Note that excess assets and unfunded

[13]Under IFRS, interest associated with the liability and the gains and losses associated with pension assets will be recorded under net finance income and expense, not as an operating expense as under GAAP. Therefore, replacing the pension expense with the service cost plus administrative expenses eliminates prior service cost from operating expenses. When forecasting free cash flow, this adjustment is required, since including prior service cost is already embedded within the market value of the liability. If you are only benchmarking performance, no adjustment to NOPLAT is required for companies reporting under IFRS.

[14]For other examples, see Chapter 9, which analyzes and values the pension obligation for UPS under GAAP, and Chapter 24, which analyzes and values the pension obligation for Heineken under IFRS.

[15]Other liabilities at DuPont include more than defined-benefit plans. The account also includes environmental remediation and technology license agreements.

EXHIBIT 20.7 **DuPont: Pension Note in Annual Report, Funded Status**

$ million

	Pension benefits			Other benefits		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
Benefit obligation at end of year	27,083	29,179	26,289	4,379	3,532	2,754
Fair value of plan assets at end of year	17,794	19,399	20,614	–	–	–
Funded status	(9,289)	(9,780)	(5,675)	(4,379)	(3,532)	(2,754)
Amounts recognized in the consolidated balance sheet						
Other assets	4	5	11	–	–	–
Other accrued liabilities	(107)	(110)	(111)	(316)	(257)	(224)
Other liabilities	(9,186)	(9,303)	(5,575)	(4,063)	(3,271)	(2,530)
Business held for sale	–	(372)	–	–	(4)	–
Net amount recognized	(9,289)	(9,780)	(5,675)	(4,379)	(3,532)	(2,754)

Source: DuPont 2011–2013 annual reports.

liabilities are reported on the balance sheet separately. This is because companies may have multiple pension plans, and pension assets from one plan are *not* netted against underfunding from another.

When reorganizing the balance sheet and income statement, separate operating assets from pension assets, and treat excess pension assets as nonoperating. Unfunded pension liabilities should be treated as a debt equivalent and, as such, should not be deducted from operating assets to determine invested capital.

Adjusting the income statement for retirement obligations Pension expenses that flow though wages and benefits on a company's income statement are composed of the following items: service cost, interest cost on plan liabilities, expected return on plan assets, recognized gains and losses (referred to by DuPont as amortization of loss), amortization of prior service cost, and curtailment expenses.[16] Exhibit 20.8 presents the pension expense breakout for DuPont. For simplicity's sake, we have combined pension expenses with other retirement benefit expenses.

To determine the portion of pension expense that is compensation to employees and not gains and losses on pension investments, treat only service cost as an operating cost. Service cost represents the new promises to employees for their current year of service. In 2013, DuPont had $300 million in service costs.

[16]Service cost represents the present value of retirement promises given to the company's employees in a particular year. Prior service costs are additional retroactive benefits given to employees from an amendment to the pension plan. Prior service costs are not expensed immediately. Instead, they are amortized over the expected lifetimes of employees. For more on pension accounting, see D. Kieso, J. Weygandt, and T. Warfield, *Intermediate Accounting*, 13th ed. (Hoboken, NJ: John Wiley & Sons, 2010), chap. 20.

EXHIBIT 20.8 **DuPont: Pension Note in Annual Report, Pension Expense**[1]

$ million

	2011	2012	2013	
Service cost	282	314	300	Operating
Interest cost	1,465	1,339	1,218	Nonoperating, related to plan performance
Expected return on plan assets	(1,475)	(1,517)	(1,524)	
Amortization of loss	673	981	1,033	
Amortization of prior service cost	(105)	(142)	(187)	Operating for historical benchmarking only
Curtailment (or settlement)	–	10	–	
Net periodic (benefit) cost	840	985	840	Information recorded on the income statement

[1] Includes expenses related to both pension benefits and other benefits.
Source: DuPont 2011–2013 annual reports.

The next three items in Exhibit 20.8—interest cost, expected return on plan assets, and amortization of loss—are related to the performance of the plan assets, not the operations of the business.[17] Therefore, they should not be included in wages and benefits to determine NOPLAT. (Pension expense is typically embedded in cost of sales.)

The way you classify the final two accounts, amortization of prior service cost and curtailment (or settlement) loss (or gain), will depend on the purpose of your analysis. If these two line items are used to forecast *future* cash flows, treat them as nonoperating, since the expense represents a past action and is already incorporated into the present value of benefits (and consequently valuation). To treat them as operating would double-count their effect. If you are benchmarking your company's financial performance against other companies, treat the expense as operating. Making changes to the plan, in the form of either new promises or curtailment of existing promises, represents a real economic benefit or cost to the company. Therefore, the economic effect of these changes should be included in any benchmarking against peers.

To remove plan performance from operating expenses, remove the pension expense—in DuPont's case, an $840 million expense in 2013—and replace it with the service cost ($300 million). These adjustments are shown in the middle section of Exhibit 20.9. Making these adjustments increases EBITA in 2013 by $540 million, more than 10 percent of pretax operating profits.

Without the appropriate adjustments, pension expense accounting can distort perceptions of corporate performance. On an unadjusted basis, DuPont's operating margin declined just 30 basis points in 2013. Stripping out the effect of pensions shows the decline was more severe, dropping from 13.4 percent to 12.7 percent, a decline of 70 basis points.

[17] Interest cost represents the present value of service cost growing into the actual retiree payout. Expected return on plan assets equals the expected return based on asset mix. Amortization of gains and losses represents the gradual recognition of past gains and losses of the pension fund.

EXHIBIT 20.9 **DuPont: Adjusted Operating Profits**

$ million

	2011	2012	2013	
Operating profits, unadjusted				
Revenues	34,423	35,310	36,144	
Operating costs	(30,044)	(31,265)	(32,093)	
EBITA, unadjusted	4,379	4,045	4,051	
Operating profits, adjusted				
Revenues	34,423	35,310	36,144	
Operating costs	(30,044)	(31,265)	(32,093)	
Add: Net periodic (benefit) cost	840	985	840	$540 in 2007
Less: Service cost	(282)	(314)	(300)	
EBITA, adjusted	4,937	4,716	4,591	
Operating margin, %				
Operating margin, unadjusted	12.7	11.5	11.2	
Operating margin, adjusted	14.3	13.4	12.7	

Source: DuPont 2011–2013 annual reports.

Recognizing the distortions caused by pension accounting as illustrated in the DuPont case, a number of companies have begun to present non–Generally Accepted Accounting Principles (GAAP) earnings numbers that exclude the nonoperating portion of retirement benefit expenses. They also use these adjusted numbers for internal target setting and compensation to limit the swings caused by the nonoperating part of pension expense when pension assets are volatile and even the pension liability can change significantly from year to year.

Reflecting retirement obligations in value Defined-benefit plans will affect a company's value in two ways. First, service cost will be embedded within free cash flow. Since only contributions are tax deductible, make sure to adjust taxes appropriately for companies that systematically underfund their obligations.[18] Second, past over- or underfunding must be incorporated into value as a nonoperating asset or debt equivalent.

For an ongoing enterprise, excess pension assets can be netted against unfunded liabilities to determine net assets (or liabilities) outstanding.[19] To incorporate pensions for a company with net excess assets, increase enterprise value by the product of (1 – marginal tax rate on pensions) times net pension

[18]Not every country provides tax relief on pension contributions, so check local tax law to determine the marginal tax rate for contributions.

[19]Most countries charge a significant penalty for withdrawing excess funds from pension plans. If the company is being valued for liquidation or the pension plan is being terminated, net unfunded liabilities cannot be netted against excess pension assets. Instead, add after-tax excess pension assets at the penalty rate, and deduct after-tax unfunded pension liabilities at the marginal tax savings for pension contributions.

assets, as excess pension assets will lead to fewer required contributions in the future. To value companies with net unfunded liabilities, reduce enterprise value by the product of (1 – marginal tax rate) times net pension liabilities.

In 2013, DuPont recognized $5,675 million in unfunded pension liabilities and $2,754 million in unfunded other benefits (see Exhibit 20.7), for a net total liability of $8,429 million. Assuming a marginal tax rate of 35 percent, the after-tax liability equals $5,479 million. To determine equity value, deduct the after-tax liability from enterprise value.

Expected Return and Earnings Manipulation

To avoid volatility in the income statement, accounting standards allow companies to include "expected returns" on pension plan assets in pension expense, rather than actual returns.[20] This enables companies to smooth pension returns from year to year, avoiding volatility in cost of sales and ultimately earnings.

Since expected return is unverifiable, company management has discretion over the rate used—a license that management may sometimes take advantage of to manipulate accounting profitability. Bergstresser, Desai, and Rauh found that management increases expected rates of return to increase profitability immediately before acquiring other firms and before exercising stock options.[21] They also found that companies with the weakest shareholder protections tend to use the highest estimates for expected return. In another study, Comprix and Muller found that managers use higher expected rates of return when their compensation committees place greater emphasis on pension income in CEO compensation.[22] It is not clear whether the market recognizes and discounts this kind of manipulation. Coronado and Sharpe found evidence that earnings associated with changed pension assumptions are capitalized into prices to the same degree as regular operating earnings.[23] This is surprising, given the market's resistance to other means of manipulating earnings (see Chapter 17). One explanation could be the continuing complexities of pension accounting; for robust valuations, these must be understood.

[20] For example, DuPont recorded $1,475 million in expected return on plan assets in 2011 even though actual returns on plan assets equaled only $471 million that same year.

[21] D. B. Bergstresser, M. A. Desai, and J. Rauh, "Earnings Manipulation, Pension Assumptions, and Managerial Investment Decisions," *Quarterly Journal of Economics* 121, no. 1 (February 2006): 157–195. For more on shareholder protection indexes, see P. Gompers, J. Ishii, and A. Metrick, "Corporate Governance and Equity Prices," *Quarterly Journal of Economics* 118, no. 1 (2003): 107–155.

[22] J. Comprix and K. A. Muller III, "Asymmetric Treatment of Reported Pension Expense and Income Amounts in CEO Cash Compensation Calculations," *Journal of Accounting and Economics* 42, no. 3 (December 2006): 385–416.

[23] J. Coronado and S. Sharpe, "Did Pension Plan Accounting Contribute to a Stock Market Bubble?" (mimeo, Board of Governors of Federal Reserve System, 2003).

CLOSING THOUGHTS

Following the financial crisis of 2007–2009, global accounting bodies have worked to close the distortions caused by off-balance-sheet obligations. Although they have made progress, inconsistencies still exist, and careful digging is still required.

Thankfully, not every company will have these off-balance-sheet obligations. Operating leases tend to be most prevalent in industries such as retailers, airlines, and hospitals that use large, easily transferable assets. Unfunded pensions are often associated with established companies, such as automobile manufacturers and steel companies, because companies founded within the past 20 years typically provide defined-contribution plans rather than traditional defined-benefit pensions. Adjust only those companies where the distortion is meaningful and your perception of performance will change.

21

Alternative Ways to Measure Return on Capital

In this book, our primary measure of return on capital is return on invested capital (ROIC). We define ROIC as net operating profit less adjusted taxes (NOPLAT) divided by invested capital. We derive ROIC from items on a company's financial statements, with a number of adjustments, such as separating operations from financing and separating operating items from nonoperating items.[1]

ROIC correctly reflects return on capital in most cases, but special circumstances require alternative measures. For example, a young biotech company could spend a billion dollars on research and development (R&D) before its product is launched. Since R&D is expensed, not capitalized, the company would show a negative ROIC in its early years and a very high ROIC once the product is launched. The actual, economic return over the life of the product would lie at some average level in between.

This chapter addresses how to handle such complexities. We'll focus on three issues. First, we explain the conditions under which ROIC accurately reflects the true economic return on capital, and when to consider a more complex measure, such as cash flow return on investment (CFROI). Second, we show how to deal with investments in R&D and marketing and sales that are expensed when they are incurred. Creating pro forma financial statements that capitalize these expenses can provide more insight into the underlying economics of a business. Finally, we discuss businesses with very low capital requirements, where we recommend using economic profit, or economic profit scaled by revenues, to measure return on capital.

[1] In Chapter 9, we explain why we use ROIC instead of other accounting-based metrics like return on equity (ROE) or return on assets (ROA).

VALUE-BASED RETURNS ON CAPITAL: ROIC AND CFROI

To be truly "value based," the measure for return on capital should reflect the internal rate of return (IRR) of the underlying business from the time investments are made until all the cash flows from that investment have been collected. That's not possible in practice, because we can't wait until the end of every project to assess a company's performance; a business is an accumulation of different investments made at different times. We need a proxy that measures how much value a company has created in the recent past and that can help a company plan for the future. Planning for the future is particularly important. Valuations often assume that historical return on capital is a good starting point for projecting future returns as a company grows. If the historical return on capital measure is not indicative of value creation, decisions about whether to continue to invest and grow a business may be incorrect.

This section explains that ROIC is that proxy in most situations, rather than a more complex measure such as CFROI. Before delving more deeply into these issues, it's important to point out that any return on capital measure should be based on the amount invested, not the current market value of the company or its assets. Take, for example, the case where the fair value of an asset is based on the intrinsic, discounted-cash-flow (DCF) value of its future cash flows. By definition, the return on capital for the asset at its fair value does not provide any indication of an investment's value creation in such assets. For a growing business, a return on capital measured against the DCF value will always be less than the cost of capital, because the DCF value reflects the value creation of future investments.

When ROIC Equals IRR

The simplest approach, which works well in most cases, is the one we use throughout this book: measuring return on capital as ROIC, or operating earnings over the net book value of a company's operating capital (purchase cost less accumulated depreciation). To illustrate when ROIC provides an accurate estimate of the IRR of an asset and the business activities it supports, we will use a stylized example. Exhibit 21.1 shows financial projections for an individual asset. The initial investment is $100, and operating cash flows are gradually declining over the asset's five-year lifetime. With linear depreciation charges of $20, the operating profit is proportional to the net invested capital in each year, declining from $15 in the first year to $3 in the last. We define ROIC in a particular year as the operating earnings for that year divided by the invested capital at the beginning of the year, net of accumulated depreciation (ignoring taxes for simplicity). In this example, the asset's ROIC is constant over the asset's lifetime at 15 percent.

When ROIC is constant, the asset provides a constant return over the initial investment, net of recovering the initial investment itself. Therefore, this return

EXHIBIT 21.1 **ROIC and CFROI When Earnings Are Proportional to Net Invested Capital**

$

		Individual asset						
		Year 0	1	2	3	4	5	Business of 5 assets
Operating cash flow		(100)	35	32	29	26	23	145
Depreciation			(20)	(20)	(20)	(20)	(20)	(100)
Operating profit			15	12	9	6	3	45
Gross invested capital, BOY[1]			100	100	100	100	100	500
Cumulative depreciation, BOY[1]			–	(20)	(40)	(60)	(80)	(200)
Net invested capital, BOY[1]			100	80	60	40	20	300
IRR, %	15.0							15.0
ROIC, %			15.0	15.0	15.0	15.0	15.0	15.0
CFROI, %			22.1	18.0	13.8	9.4	4.8	13.8
					ROIC is constant over asset lifetime. CFROI decreases over asset lifetime.			ROIC = IRR CFROI < IRR

[1] BOY is beginning of year.

must also equal the IRR of the cash flows for the asset, or 15 percent. More precisely, the investment's ROIC equals the IRR if the earnings generated from the investment are proportional to the invested capital, net of accumulated depreciation, in each year of the investment's lifetime.

It is possible to generalize the result for a business consisting of a portfolio of five of these individual assets, which have remaining lifetimes of one, two, three, four, and five years, respectively (see the rightmost column in Exhibit 21.1). For this business, the operating cash flow, earnings, and invested capital are a straightforward sum of the operating cash flow, earnings, and invested capital for each year of the individual asset's lifetime (for example, operating cash flows for the business equal \$35 + \$32 + \$29 + \$26 + \$23 = \$145). What holds for the assets will therefore also hold for the business as a whole, so its ROIC must equal an individual asset's ROIC and IRR of 15 percent. If this business wants to grow its earnings by, say, 10 percent, it will need to expand its net invested capital by 10 percent as well (requiring an investment outlay of \$30 in this case). The IRR on that incremental investment for carbon-copy growth equals exactly the business's ROIC of 15 percent.

This means that the ROIC of a business (or company) is equal to the IRR of new investments if the operating earnings for the business are proportional to net invested capital.[2] In these conditions, ROIC is a value-based measure of

[2]The same logic underlies the value driver formula introduced in Chapter 2, which showed that DCF value increases only for earnings growth at a ROIC above the cost of capital.

return on capital, even though it is based on accounting measures of earnings and capital.

When CFROI Equals IRR

CFROI is an alternative measure of return on capital based on cash flow rather than profit and book value.[3] For any given year, CFROI is defined as the discount rate for which the present value of that year's operating cash flow (as an *N*-year annuity) equals gross invested capital at the beginning of the year (where *N* is the lifetime of the underlying asset). The basic formula for calculating CFROI in a given year *T* is:[4]

$$\text{GIC}_T = \sum_{t=1}^{N} \frac{\text{OCF}_T}{(1 + \text{CFROI})^t} \tag{21.1}$$

where GIC_T = gross invested capital at the beginning of year T
OCF_T = operating cash flow in year T

We illustrate CFROI by showing financial projections for an asset whose economics are different from those of the prior example. As shown in Exhibit 21.2, the operating cash flows in this case are constant over the asset's lifetime at \$29 per year. The IRR for the investment is now 13.8 percent and exactly equals the CFROI, which is constant over the asset's lifetime. Take, for example, year 2. We estimate the asset's CFROI by solving the following equation:

$$\$100 = \frac{\$29}{(1 + \text{CFROI})^1} + \ldots + \frac{\$29}{(1 + \text{CFROI})^5} \Rightarrow \text{CFROI} = 13.8\%$$

In fact, when the operating cash flow is constant over an asset's lifetime, CFROI must be equal to the IRR (as is obvious from the preceding formula). We could also say that CFROI equals the IRR of an investment if the operating cash flows generated are proportional to the gross invested capital (before accumulated depreciation).

Let's generalize the results again to a business consisting of five such individual assets, with remaining lifetimes of one, two, three, four, and five years (the right column in Exhibit 21.2). As in the prior example, the business's

[3]For more information, see B. Madden, *CFROI Valuation: A Total System Approach to Valuing the Firm* (Oxford, UK: Butterworth-Heinemann, 1999).
[4]Any residual value of the asset should be included as an additional cash flow for year *N* and discounted at CFROI.

EXHIBIT 21.2 **ROIC and CFROI When Cash Flows Are Proportional to Gross Invested Capital**

$

	Individual asset						Business of 5 assets
	Year 0	1	2	3	4	5	
Operating cash flow	(100)	29	29	29	29	29	145
Depreciation		(20)	(20)	(20)	(20)	(20)	(100)
Operating profit		9	9	9	9	9	45
Gross invested capital, BOY[1]		100	100	100	100	100	500
Cumulative depreciation, BOY		–	(20)	(40)	(60)	(80)	(200)
Net invested capital, BOY		100	80	60	40	20	300
IRR, %	13.8						13.8
ROIC, %		9.0	11.3	15.0	22.5	45.0	15.0
CFROI, %		13.8	13.8	13.8	13.8	13.8	13.8

ROIC increases over asset lifetime.
CFROI is constant over asset lifetime.

ROIC > IRR
CFROI = IRR

[1] BOY is beginning of year.

overall cash flows, earnings, and invested capital derive from those of the underlying five assets. The business's CFROI and IRR therefore equal the CFROI and IRR of each individual asset. If this particular business wants to grow its cash flows by, say, 10 percent, it has to expand its gross invested capital by 10 percent as well (implying an investment outlay of $50). The IRR on that incremental investment is now equal to its CFROI of 13.8 percent. Note that the business ROIC of 15 percent overestimates the IRR in this case. In general, the business (or company) CFROI is exactly equal to the IRR of new investments if operating cash flows for the business are proportional to gross invested capital.

When to Use ROIC or CFROI

Let's now compare the two examples in Exhibits 21.1 and 21.2 in more detail. Note that the businesses (not the assets) in both examples have identical ROIC, CFROI, earnings (operating profit), operating cash flow, and invested capital. Nevertheless, the underlying economics and value creation are quite different, as is the "right" measure for return on capital.[5]

For the example in Exhibit 21.1, ROIC is the right measure of return on capital for the asset and the business, equaling the IRR of 15 percent. The reason:

[5] Even though the cumulative cash flows over the lifetime of the underlying assets are equal, the assets shown in Exhibit 21.1 generate higher cash flows earlier in their lifetimes. As a result, the value creation is higher, as reflected in the assets' IRR of 15.0 percent versus 13.8 percent for the assets in Exhibit 21.2.

the cash flow pattern over the lifetime of the asset leads to *earnings* that are proportional to *net* invested capital in each year. At the asset level, this results in a constant ROIC and a changing CFROI over the asset's lifetime. At the business level, it implies that aggregate earnings and net invested capital grow in line with each other (assuming that growth comes only from adding more assets to the business).[6]

For the example in Exhibit 21.2, CFROI is the right measure and equal to the IRR of 13.8 percent, because now the *operating cash flows* are proportional to *gross* invested capital. At the asset level, CFROI is constant over the asset's lifetime, and ROIC continues to increase as the capital base is depreciated. For the business, this means that aggregate operating cash flows and gross invested capital grow in line with each other.

These two examples illustrate that there is no single right measure of return on capital. Depending on the earnings and cash flow pattern of the investment projects underlying a business, ROIC or CFROI can be equal to IRR—in theory. The fact that CFROI is calculated based on cash components does not mean it is always superior to the accounting-based ROIC.

Although the examples were stylized, it is possible to derive general insights about the theoretical trade-offs between ROIC and CFROI. CFROI is more appropriate in businesses where investments are very lumpy. As two extreme examples, think of infrastructure projects or hydroelectric power plants. These require very substantial up-front investments that generate relatively stable cash flows without significant investments in maintenance or overhauling over many years, or even decades. Although accounting conventions may require that the assets be depreciated, their net capital base has little bearing on the capacity to generate cash flows. ROIC often rises to levels that are unrelated to the project's economic return (IRR), but CFROI will be much closer to the IRR because the operating cash flows are very stable.

In contrast, ROIC is likely to be a better estimate of the underlying IRR in businesses where investments occur in a more regular and smoother pattern because they are needed to support the earnings. As an example, think of retail supermarkets or a manufacturing company with many plants and pieces of equipment. These businesses require regular investments as management maintains, upgrades, and renews product lines and shop formats. In the periods between making such investments, pricing and earnings are likely to face pressure from competition with newer products or formats. As a result, the depreciated capital base is a reasonable approximation of the ability to generate earnings, making ROIC a better estimate of underlying IRR. In our experience, this is the case for most companies: maintenance and replacement investments are required on an ongoing basis to support the operating earnings.

[6]Note that this is in fact the economic model that we assumed in deriving the ROIC-growth value driver formula in Chapter 2.

Apart from these theoretical considerations, some practical trade-offs exist between ROIC and CFROI. For example, it is possible to more readily derive ROIC and its components, such as operating earnings and book value of invested capital, from standard financial reporting statements with some reorganization and adjustments (as described in Chapter 9). Once you have the components, ROIC is a straightforward ratio that most managers are familiar with. In contrast, CFROI requires a far more complex, iterative calculation that is not transparent to many managers.[7]

Because of the way CFROI is defined and calculated, interpreting it is less straightforward than in the case of ROIC. For example, it follows that to double the ROIC, managers would need to double their profit margin or double their capital turnover. With this logic, any reductions in inventory levels or costs of raw materials, for example, translate easily into ROIC improvements. In contrast, doubling capital turnover does not necessarily translate to doubling CFROI, because it is not a simple ratio. For the same reason, deriving the CFROI for a division or corporate group does not easily follow from the CFROIs of the underlying business units. A group's ROIC, however, is simply the capital-weighted average of the ROICs of the underlying businesses.

In its precise definition, CFROI includes an adjustment for the effect of inflation on returns. The gross invested capital is indexed for inflation over the years dating to the initial purchase of the assets involved. For most economies in North America and Western Europe, this usually does not make a big difference. But the impact of the adjustment is significant when inflation is more than a couple of percentage points per year. In some cases, we found that this adjustment was the key source of difference between a company's CFROI and ROIC. However, adjustments for inflation can also be made when calculating ROIC. Basically, the adjustment involves using current-year dollars to express depreciation and property, plant, and equipment (PP&E). Adjusting ROIC for inflation and using CFROI with its inflation adjustment typically lead to similar results across widely different inflation rates and asset lifetimes, as shown in Exhibit 21.3. (See Chapter 22 for more details about inflation's impact on ROIC and cash flows.)

Differences between ROIC and CFROI could be sizable for specific businesses, depending on their economics, as we saw in the preceding two examples. Nevertheless, when we analyzed 1,000 U.S. companies between 2003 and 2013, we found that, on average, these differences were not very large (see Exhibit 21.4). The spread between the average ROIC and CFROI was three percentage points or less for all but one of the 10 nonfinancial sectors we considered (when taking both ROIC and CFROI without inflation adjustments). The difference between the highest- and lowest-quartile ROIC in a sector was

[7]For this reason, practitioners have developed approximations of CFROI that are based on less complex calculations (see, for example, A. Damodaran, *Investment Valuation*, 2nd ed. (New York: John Wiley & Sons, 2002) chap. 32).

EXHIBIT 21.3 **Inflation-Adjusted ROIC and CFROI**

%

		After 20 years		
Inflation rate	Asset life, years	ROIC	CFROI[1]	Inflation-adjusted ROIC
0	5	15	14	15
2	5	17	13	12
4	5	19	13	11
6	5	22	13	10
8	5	24	12	10
10	5	26	12	10
0	10	15	13	15
2	10	19	12	11
4	10	23	12	10
6	10	27	11	10
8	10	31	11	10
10	10	35	11	10
0	20	17	12	17
2	20	21	12	15
4	20	25	12	14
6	20	30	12	13
8	20	35	11	13
10	20	39	11	13

[1] CFROI includes an inflation adjustment.

typically four times larger than this spread. Thus, whether you measure a business's return on capital by using ROIC or CFROI is unlikely to make a difference in what it tells you about the company's relative performance versus that of sector peers.

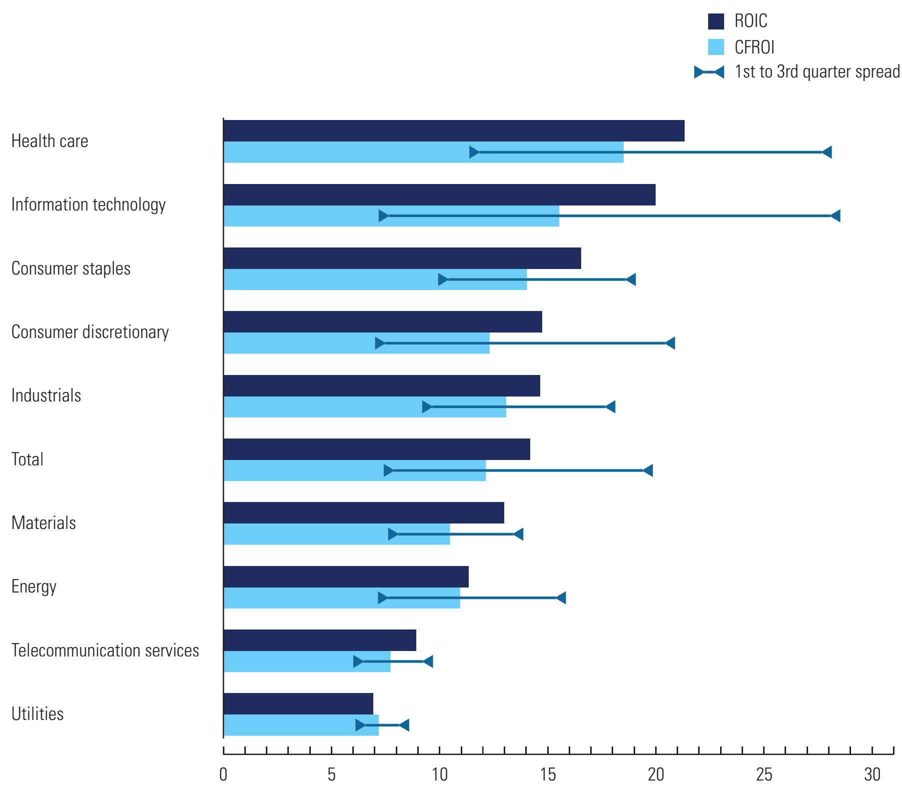
CAPITALIZING EXPENSED INVESTMENTS

When a company builds a plant or purchases equipment, it capitalizes the asset on the balance sheet and depreciates it over time. Conversely, when a company invests in intangible assets such as a new production technology, a brand name, or a distribution network, the entire outlay must be expensed immediately. In sectors such as pharmaceuticals, high technology, and branded consumer goods, failure to recognize such expenses as investments can lead to significantly underestimating a company's invested capital and overstating its return on invested capital.

To get a more accurate measurement of ROIC (or CFROI), it's best to capitalize outlays for intangible investments if they bring benefits over multiple years in the future rather than merely for the current year. Earnings in any given year are supported by not just that year's R&D or brand advertising

EXHIBIT 21.4 **Pretax ROIC and CFROI per Sector, 2003–2013**

10-year average of median ROIC and CFROI by sector,[1] %



[1] For the 1,000 largest U.S. nonfinancial companies by market capitalization.

expenses, but instead by many prior years of these expenses. It has taken companies such as Coca-Cola and PepsiCo many decades and billions of dollars to build their global brand names. Pharmaceutical companies such as Pfizer and Novartis, and high-tech companies such as Intel and ASML, had to invest in research projects over many years to build and sustain their current product offerings.

The economics of investments in intangible assets are very similar to those of investments in tangible assets. Their treatment in ROIC should therefore also be the same to ensure that it adequately reflects the IRR of the underlying investments, following the logic laid out in the prior section. Failure to do so would lead to ROICs far above the true IRR of the business. Think of what would happen to ROIC if capital expenditures for net property, plant, and equipment (net PP&E) were not capitalized but were expensed instead.

In addition to improving the measurement of ROIC, capitalizing intangible investments can reduce the manipulation of short-term profits. Under

EXHIBIT 21.5 **PharmaCo: Reorganized Financial Statements**

$ million

Partial income statement	2010	2011	2012	2013	2014	2015	
Revenues	1,045	1,077	1,109	1,142	1,176	1,212	
Cost of sales	(627)	(646)	(665)	(685)	(706)	(727)	← Fixed at 60%
R&D expense	(229)	(235)	(242)	(248)	(255)	(262)	
Operating profit	189	195	202	208	215	222	
Taxes	(76)	(78)	(81)	(83)	(86)	(89)	
NOPLAT	113	117	121	125	129	133	
Partial balance sheet							
Invested capital	348	359	370	381	392	404	← Fixed at 3 times
NOPLAT/revenues, %	10.9	10.9	10.9	10.9	11.0	11.0	
ROIC, %	32.6	32.7	32.8	32.8	32.9	33.0	

traditional accounting, a manager looking to meet short-term earnings targets can simply reduce R&D spending. Capitalizing investments can also provide strategic insights. For example, many companies set R&D budgets at a fixed percentage of revenue. When combined with expensing R&D, this masks the drop in performance resulting from any decrease in growth, because the earnings margin remains unchanged.

Example: Capitalizing R&D Expenses

As an illustration of capitalizing intangible investments and its impact on ROIC, Exhibit 21.5 presents the reorganized financial statements for PharmaCo. This fictional company has experienced rapid growth over the past 25 years, reaching around $1.2 billion in revenues by 2015. The after-tax earnings margin is at 11 percent of sales. R&D expenses, to renew the product pipeline, are at around 20 percent of sales. ROIC is at 33 percent, with revenues at three times invested capital as computed directly from the balance sheet. But this ROIC does not represent the company's true economic performance, because the invested capital includes only purchased capital and not the intellectual capital created internally from R&D.

To estimate ROIC with capitalized investments in R&D, use the following three-step process:

1. Build and amortize the R&D asset, using an appropriate asset life.
2. Adjust invested capital upward by the historical cost of the R&D asset, net of cumulative amortization.
3. Adjust NOPLAT by replacing R&D expense with R&D amortization (do not adjust operating taxes).

EXHIBIT 21.6 **PharmaCo: Capitalization of R&D**

$ million

Estimated asset life: 8 years

Partial income statement	1990	1991	1992		2013	2014	2015
Revenues	10	22	43	…	1,142	1,176	1,212
R&D expense	(22)	(24)	(29)	…	(248)	(255)	(262)
Capitalized R&D asset							
R&D intangible, starting	–	22	44	…	1,477	1,541	1,604
R&D expense	22	24	29	…	248	255	262
Amortization	–	(3)	(5)	…	(185)	(193)	(200)
R&D intangible, ending	22	44	67	…	1,541	1,604	1,666
Partial balance sheet							
Invested capital (unadjusted)	3	7	14	…	381	392	404
R&D intangible asset	22	44	67	…	1,541	1,604	1,666
Invested capital (adjusted)	25	51	81	…	1,922	1,996	2,070

To build the R&D asset, choose a starting year, and begin accumulating R&D expenses. Choose the earliest year feasible, as the model requires accumulated R&D to reach a steady state before the adjusted ROIC calculation becomes meaningful. Exhibit 21.6 starts in year 1990, assuming straight-line amortization and an eight-year R&D asset life. PharmaCo spent $22 million on R&D in 1990, which we capitalize and add to invested capital and start to amortize in 1991. By adding R&D expenses to the prior year's net asset value and then deducting amortization charges in each year, we arrive at a capitalized R&D asset base of $1,666 million in 2015.[8]

To adjust invested capital for the intangible investments, add the capitalized R&D asset to invested capital. On this basis, PharmaCo's total capital amounts to $2,070 million in 2015, most of it in the form of capitalized R&D.[9]

Adjust NOPLAT by replacing R&D expense ($262 million in 2015) with R&D amortization ($200 million), computed as outlined in Exhibit 21.7. Operating taxes remain unchanged, because capitalization and amortization of R&D expense do not change taxable income for fiscal purposes. For PharmaCo, replacing R&D expense with amortization raises NOPLAT in 2015 from $133 million to $195 million. This is quite common for growth firms, as current R&D is typically higher than the amortization of historical R&D. As the company's growth rate tapers off, however, amortization will catch up with expense, and NOPLAT adjustments will be small. Note that for PharmaCo's historical years, free cash flows cannot change when capitalizing R&D expenses (see

[8] In this example, we approximate amortization at 10 percent of the preceding year's ending balance for illustration purposes. Advanced models use straight-line amortization of actual R&D expense.

[9] If we add capitalized R&D to operating assets, total funds invested will no longer balance. To balance total funds invested, add capitalized R&D to equity equivalents. For more on total funds invested and their reconciliation, see Chapter 9.

EXHIBIT 21.7 **PharmaCo: Net Operating Profit Less Adjusted Taxes**

$ million

	2011	2012	2013	2014	2015
Revenues	1,077	1,109	1,142	1,176	1,212
Cost of sales	(646)	(665)	(685)	(706)	(727)
R&D expense	(235)	(242)	(248)	(255)	(262)
Operating profit	195	202	208	215	222
Operating taxes	(78)	(81)	(83)	(86)	(89)
NOPLAT	117	121	125	129	133
Add back: R&D expense	235	242	248	255	262
R&D amortization	(168)	(177)	(185)	(193)	(200)
Adjusted NOPLAT	184	186	189	192	195
ROIC, %	32.7	32.8	32.8	32.9	33.0
ROIC adjusted for resources, %	10.4	10.1	9.8	9.6	9.4

Exhibit 21.8). The amortization is a noncash charge in NOPLAT and added back to calculate gross cash flow. This effectively moves R&D expenses from gross cash flow to investments, leaving free cash flow unchanged.

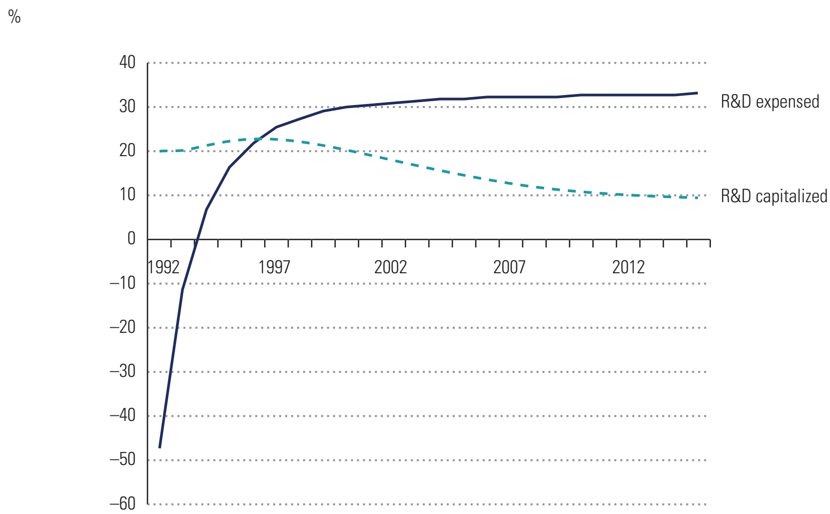
Based on the new measures for invested capital with capitalized R&D investments and for NOPLAT with R&D amortization instead of expenses, we derive an adjusted ROIC. The adjusted ROIC with R&D capitalized represents PharmaCo's return on capital, including intangible investments. It can be compared with an unadjusted ROIC with R&D expensed in Exhibit 21.9. Because the R&D asset lifetime was estimated at eight years, it takes until at least as many years of constant growth for capital and ROIC to reach a steady state

EXHIBIT 21.8 **PharmaCo: Free Cash Flow**

$ million

R&D expensed (unadjusted)	**2012**	**2013**	**2014**	**2015**
NOPLAT	121	125	129	133
Depreciation	37	38	39	40
Gross cash flow	158	163	168	174
Capital expenditures	(48)	(49)	(51)	(52)
Free cash flow	**110**	**114**	**118**	**122**
R&D capitalized				
Adjusted NOPLAT	186	189	192	195
Depreciation	37	38	39	40
→ Amortization of R&D	177	185	193	200
Gross cash flow	400	412	424	436
Capital expenditures	(48)	(49)	(51)	(52)
→ Investment in R&D	(242)	(248)	(255)	(262)
Free cash flow	**110**	**114**	**118**	**122**

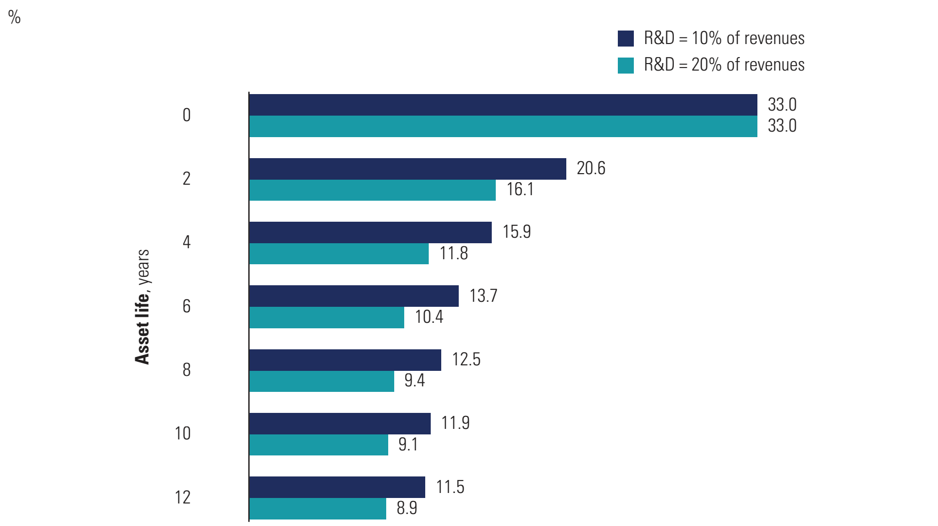
EXHIBIT 21.9 **PharmaCo: ROIC, 1992–2014**



and provide a meaningful indication of true economic returns. As Exhibit 21.9 shows, the adjusted ROIC computed on total capital stabilizes at around 9.5 percent, dramatically lower than the 33 percent ROIC derived from the unadjusted financial statements. As long as the R&D investments that are needed to support earnings remain unchanged, PharmaCo's adjusted ROIC is the better estimate of its IRR and true underlying economic performance.

One of the key assumptions made in capitalizing intangible investments is the asset lifetime. Although it may be hard to come up with an accurate estimate, this should not keep you from capitalizing the R&D expenses. Asset lifetime has less impact on ROIC than you might expect. In the PharmaCo example, we assumed an asset life of eight years. In Exhibit 21.10, we stress-test this assumption by varying asset life between two and 12 years. Even an asset life of just two years dramatically reduces PharmaCo's ROIC from 33 percent, when R&D is expensed, to 16 percent when it is capitalized. Increasing the asset life continues to lower ROIC, but by smaller amounts as asset life increases. So choosing an asset life of 12 rather than eight years (a reasonable range for the life of most R&D assets) does not materially affect perceptions of performance (for PharmaCo, ROIC would be 8.9 percent for 12-year life versus 9.4 percent for eight-year life). This pattern remains unchanged when R&D spending is much lower—for example, at only 10 percent of revenues. Furthermore, when using ROIC to compare performance between competing companies, what matters most is that asset lifetime estimates are consistent across all companies. Keep in mind that the lifetimes for tangible assets also are based on rough estimates and accounting conventions. Yet most managers and

EXHIBIT 21.10 **PharmaCo: ROIC at Different Estimates of R&D Lifetime, 2015**



analysts are quite comfortable using tangible-asset book values and depreciation charges as the basis for return on capital and earnings.[10]

Interpreting Return on Capital, Including Intangible Resources

In general, capitalizing intangible investments will lead to lower ROIC. For mature companies with stable revenues and investment spending, the amortization charges for intangible assets are likely to be close to the amounts expensed. As a result, NOPLAT might not be affected that much by capitalizing the expenses. But the capital base will always increase when the expenses are capitalized, leading to lower ROIC.

Although the capitalization can never change historical free cash flows, as discussed in the PharmaCo example, the resulting adjustments to capital turnover and ROIC can affect projections of future free cash flows. For PharmaCo, required investments in R&D to achieve growth of 10 percent per year would be estimated at $375 million in 2016, which is $113 million more than the $262 million spent in 2015. This follows from required growth of the net R&D asset base (10 percent, or $167 million) plus an annual amortization charge of $208 million (one-eighth of the 2015 ending balance). When R&D investments going forward would be modeled as expenses, the required additional R&D outlay in 2016 would be only 10 percent of the additional 2016 revenues, or $26

[10]Note that also for CFROI with or without resource capitalization, estimates of asset lifetimes are critical—not for book value or depreciation, but for estimating the solution to equation 21.1.

million. This is comparable to what happens to investment projections if capital expenditures for tangible assets are derived from a constant ratio to revenues or implied from a constant capital turnover (see Chapter 11).

If PharmaCo can grow its revenues by 10 percent as a result of growing its R&D expenses by 10 percent, the unadjusted ROIC provides the best estimate of the IRR of future investments in its business. In contrast, if achieving that same revenue growth would require PharmaCo to grow its net R&D asset base, rather than its R&D expenses, by 10 percent, the adjusted ROIC is the better estimate. Of course, these R&D investment estimates for PharmaCo are not likely to apply from year to year. What matters is which R&D investments are required for growth over the long term.

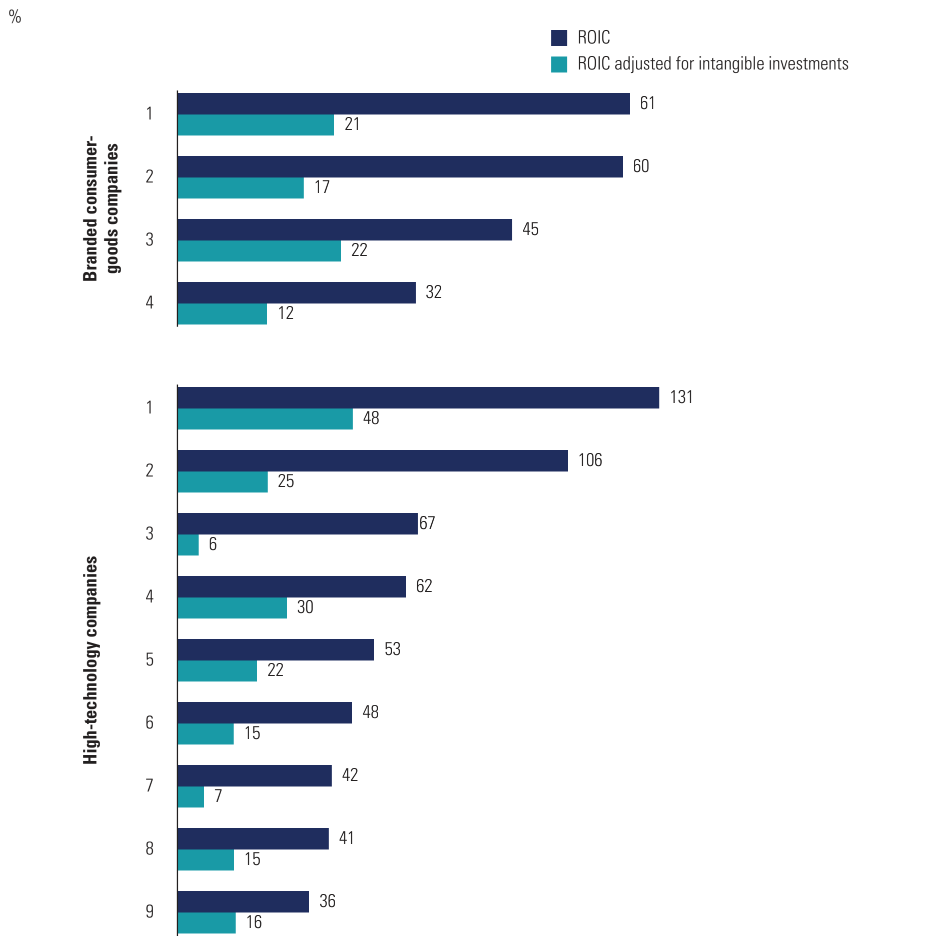
More accurately reflecting the economics of intangible investments on ROIC can have major implications for investment decisions, performance assessments, resource allocation, and competitive behavior. For instance, if the cost of capital is 10 percent, PharmaCo is in fact destroying value, and management should question continued investment. Competitors should question the validity of entering the company's product markets. The margins may be high, but required investments in R&D are large.

To illustrate the impact of capitalizing intangibles on estimates of ROIC and perspectives on value creation, we analyzed past spending on research and advertising over the last 10 years for four global companies in branded consumer goods. After capitalizing and amortizing the estimated past expenses in R&D and advertising, ROIC for all companies decreased significantly and also provided a very different ranking of performance, as shown in the top portion of Exhibit 21.11. A similar analysis of ROIC including capitalized R&D expenses among high-tech hardware manufacturers provided similar shifts in perceived performance levels and rankings (see the bottom portion of Exhibit 21.11).

For diversified companies, capitalizing resources could significantly change the ROICs for business units. Units in branded consumer-goods or high-tech industries, for example, typically incur high, ongoing expenses for R&D and/or brand advertising. In many cases, such expenses are in fact investments and should be capitalized. Other units could be less resource intensive or rely mostly on tangible assets that are already capitalized. As a result, the ranking of business unit ROICs could radically change, triggering a reallocation of financial resources to pursue profitable growth across the portfolio.

Capitalizing intangibles can also provide a better financial perspective on competitive positions. Think of comparing current budgets on brand advertising between incumbents and new entrants in personal or household products. The comparison is not very useful if the incumbent brands have been built by many years of marketing efforts. Incumbents' current advertising budgets will then underestimate the investments required by new entrants to reach similar levels of brand awareness among customers. A capitalized investment base can provide a more accurate estimate.

EXHIBIT 21.11 **ROIC Adjusted for Intangible Investments**



While insights from capitalizing resources are valuable, companies must take care. Left unchecked, managers could have an incentive to classify all expenses as investments, even those with no long-term benefits, because this will maximize reported short-term performance. They could also be reluctant to write off investments that prove worthless. For instance, a distribution channel may be kept open merely to avoid a write-down on the manager's economic balance sheet.

WHEN BUSINESSES NEED LITTLE OR NO CAPITAL

Most businesses need some form of invested capital, typically in tangible assets such as net PP&E and working capital. Sometimes the capital takes the form of investments in R&D and advertising. In that case, it is possible to make adjustments in invested capital and ROIC to adequately measure value creation in a business (as discussed in the preceding section). In other cases, the capital is used but owned by third parties—for example, when real estate or equipment is rented or leased. For those situations, we make adjustments to capital and ROIC as discussed in Chapter 20. In still other cases, we come across business models that do not require significant amounts of true, underlying capital—for example, in the professional services sector, but also among consumer electronics companies with outsourced manufacturing. Because of these companies' low or even negative capital base, ROIC can become less meaningful. In such cases, we recommend using economic profit as the key measure of value creation.

Capital-Light Business Models and ROIC

Some businesses have an inherently low need for capital. Examples include accounting, legal counseling and other professional services, and real estate and other forms of brokerage services. Businesses such as software development and services have limited fixed capital needs, and customer license prepayments and supplier financing often bring their overall invested capital close to zero. In these cases, capital is very low relative to earnings generated, and ROIC accordingly is high. Modest changes in an already small invested-capital base can lead to very large swings in ROIC, making ROIC in any particular year or month hard to use for performance management or financial planning and target setting.

Let's illustrate with a stylized example of TradeCo, whose financial statements are summarized in Exhibit 21.12. TradeCo is a trading company in plumbing supplies and tools. It has its offices and warehouse in a low-cost location. Inventories are kept to a minimum, except for those items with the highest turnover, supplies and tools are purchased on customer order. Because TradeCo pays its suppliers after receiving payment on its own customer invoices, working capital is negative as a rule. As Exhibit 21.12 shows, revenues, earnings, and free cash flow are fairly stable on a year-by-year basis.

But as the graph in Exhibit 21.13 shows, ROIC fluctuates wildly and is even unmeasurable in some years, despite stable earnings margins and healthy cash flows. The reason is that TradeCo's invested capital is very small and sometimes even negative, mainly because of movements in working capital. ROIC is not meaningful in 2010 and 2012 because the company had negative invested capital. ROIC is numerically negative, but it lacks any economic interpretation. Looking at the bottom of Exhibit 21.12, we see that economic profit was positive in 2012, clearly indicating value creation. In other years, the movements in ROIC could also mislead your assessment of performance. For example, ROIC increased from 308 percent in 2014 to 773 percent in 2015. Yet value creation

EXHIBIT 21.12 **TradeCo: Financial Statements**

NOPLAT, $ million	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Revenues	50.0	52.3	53.0	54.1	53.6	53.0
Cost of goods sold	(40.0)	(41.3)	(42.4)	(43.8)	(42.8)	(42.4)
SG&A	(5.0)	(5.2)	(5.3)	(5.4)	(5.4)	(5.3)
Operating taxes	(1.8)	(2.0)	(1.9)	(1.7)	(1.9)	(1.9)
NOPLAT	**3.3**	**3.7**	**3.4**	**3.2**	**3.5**	**3.4**
Invested capital, $ million						
Net working capital	(3.0)	(2.1)	(2.7)	(0.5)	(1.1)	(1.6)
Net PP&E	2.5	2.3	2.3	2.2	2.2	2.0
Invested capital	**(0.5)**	**0.2**	**(0.3)**	**1.6**	**1.1**	**0.4**
Free cash flow, $ million						
NOPLAT	3.3	3.7	3.4	3.2	3.5	3.4
Net investments	(0.5)	(0.7)	0.5	(1.9)	0.5	0.7
Free cash flow	**2.8**	**3.0**	**4.0**	**1.2**	**4.0**	**4.1**
Key value drivers, %						
NOPLAT/revenues	6.5	7.2	6.5	5.9	6.5	6.5
Invested capital/revenues	(1.0)	0.4	(0.6)	3.0	2.1	0.8
→ ROIC	n/m[1]	1,679.0	n/m[1]	195.0	308.0	773.2
Economic profit, $ million						
NOPLAT	3.3	3.7	3.4	3.2	3.5	3.4
Capital charge[2]	(0.1)	0.0	(0.0)	0.2	0.1	0.0
→ Economic profit	**3.2**	**3.8**	**3.4**	**3.3**	**3.6**	**3.5**

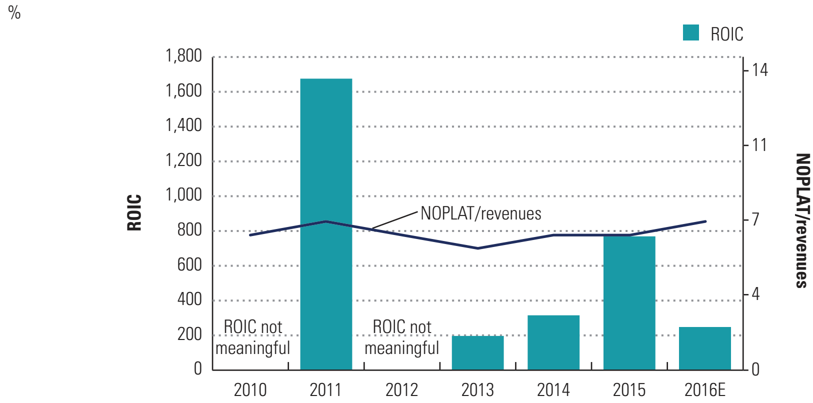
[1] Not meaningful.
[2] Cost of capital equals 10%.

declined, as the change in economic profit for the same period shows. The change in ROIC was driven by a decline in working capital. Earnings declined simultaneously and pushed down value creation.

Not all businesses with low capital are inherently capital-light. Indeed, some capital-intensive businesses have adopted capital-light models by outsourcing their most capital-intensive processes—typically manufacturing and distribution. The high-tech electronics sector provides examples of this approach, such as Apple, Hewlett-Packard, and Philips. In the apparel sector, companies such as Nike have outsourced their manufacturing processes, and in the financial sector many banks and insurance companies have outsourced large portions of their information systems and processes.

ROICs for businesses that have aggressively outsourced parts of their business chain can be very high and can suffer from similar distortions as measures of value creation, as discussed earlier in this chapter. In addition, the capital reduction that comes with outsourcing can lead to confusion when ROIC is used to assess whether outsourcing creates any value to begin with. After outsourcing, many businesses end up with much higher ROICs. In some cases, the

EXHIBIT 21.13 **TradeCo: ROIC and NOPLAT Margin**



higher ROIC is even referred to by managers as one of the main benefits of outsourcing. But the ROIC increase does not necessarily mean that the company has created value for its shareholders.

Consider the companies InhouseCo and ContractCo in Exhibit 21.14. The companies are identical with one exception: ContractCo has outsourced all

EXHIBIT 21.14 **Production Outsourcing and ROIC**

$ million

	InhouseCo	ContractCo
NOPLAT		
Revenues	100.0	100.0
Cost of goods sold	(85.0)	(94.5)
SG&A	(3.8)	–
Operating taxes	(3.9)	(1.9)
NOPLAT	7.3	3.6
Invested capital		
Net working capital	5.0	5.0
Net PP&E	50.0	–
Invested capital	55.0	5.0
Key value drivers, %		
NOPLAT/revenues	7.3	3.6
Invested capital/revenues	55.0	5.0
→ ROIC	13.3	71.2
Economic profit		
NOPLAT	7.3	3.6
Capital charge[1]	(4.1)	(0.4)
→ Economic profit	3.2	3.2

[1] Cost of capital equals 7.5%.

of its production to a third party. It has no net PP&E and capital expenditure charges, but it has higher costs of raw materials and components compared with InhouseCo. Although ContractCo's earnings are somewhat lower than InhouseCo.'s, its ROIC is more than five times larger because it no longer needs net PP&E. But ContractCo is not creating more value in its business than InhouseCo. In fact, as the measure of economic profit indicates, the two companies' value creation is identical. In this example, ContractCo has merely separated out its capital-intensive and low-ROIC production activities from its other activities, but without creating value. The ROIC for ContractCo simply goes up because it retains only the high-ROIC activities. But that does not say anything about the value creation from outsourcing.[11] Managers should therefore not make decisions to outsource merely on the grounds that it results in higher ROIC for their company. These decisions need to be supported by an analysis of economic profit or, equivalently, a DCF valuation.

Economic Profit as Key Value Metric

Although there is no objective way to determine a cutoff point, we believe that ROICs above 50 percent need to be handled with caution as a measure of value creation. Special caution is required in businesses where high capital turnovers, rather than high earnings margins, drive such ROIC levels.

In such cases, economic profit is a more solid measure for performance that is always in line with value creation (see Chapter 2 for more details on economic profit). It can be defined in two equivalent ways:

$$\text{Economic Profit} = (\text{ROIC} - \text{WACC}) \times \text{Invested Capital} \tag{21.2}$$

or

$$\text{Economic Profit} = \text{NOPLAT} - \text{Capital Charge} \tag{21.3}$$

where capital charge = WACC × invested capital.

Because ROIC is multiplied by invested capital, economic profit automatically corrects for any distortion in ROIC for business models with extremely low capital intensity. The TradeCo example in Exhibit 21.12 illustrated this. ROIC shows very strong fluctuations over the years, even becoming unmeasurable in some years. In contrast, economic profit is fairly stable, just as TradeCo's cash flows are stable and consistently positive over the years. Economic profit is a much better reflection of TradeCo's underlying business economics. It provides more accurate insights into its historical performance and a useful basis for targets for future performance.

[11] Of course, outsourcing in this example could still create real value if it enables ContractCo to realize higher growth because it now faces lower capital needs for its business.

EXHIBIT 21.15 **DiversiCo: Economic Profit Scaled by Revenues**

$ million

	Revenues	Invested capital	NOPLAT	NOPLAT revenues, %	ROIC, %	Economic profit[1]	Economic profit/ revenues,[1] %
Software	100	(5)	25	25	–500	25	25
Hardware services	250	10	44	18	438	43	17
Supplies	750	250	94	13	38	73	10
Hardware	2,500	1,000	188	8	19	103	4

[1] Cost of capital is 8.5%.

Economic profit is a measure of return on capital in absolute terms. It is very useful to understand whether value creation in a particular business has increased from one year to the next. But it is harder to interpret differences in economic profit generated by businesses of different size. Take, for example, DiversiCo in Exhibit 21.15. DiversiCo is a diversified industrial company with business units in software, hardware, hardware services, and supplies. The business units are very different in size and economics. Hardware, for example, has annual revenues of $2.5 billion, dwarfing the $100 million in revenues generated by software development. The software business has negative invested capital, thanks to customer prepayments, whereas hardware requires $1 billion in capital, mainly for manufacturing and distribution facilities and inventories. ROIC is meaningless in comparing performance across the DiversiCo's businesses, because software and hardware services have little or negative capital. Economic profit provides an accurate picture of value creation but is hard to compare between businesses of such different size. Economic profit is lowest for the software business at $25 million, not so much because of its performance, but because of its size.

To better compare the value creation across DiversiCo's businesses, scale economic profit by revenues to turn it into a measure of value creation per dollar of sales.[12] From Exhibit 21.15, it now becomes clear that DiversiCo's software business generates the highest value per dollar of revenues, and its hardware business the lowest. Driving revenue growth in software development would therefore be most beneficial for shareholders.[13] Scaling economic profit in this way provides DiversiCo's management with a better yardstick for decisions on resource allocation and portfolio strategy.

[12]See M. Dodd and W. Rehm, "Comparing Performance When Invested Capital Is Low," *McKinsey on Finance* (Autumn 2005): 17–20.

[13]Note how economic profit over revenues is almost identical to NOPLAT margin for capital-light businesses such as software and hardware services in this example. This is easily explained by examining equation 21.3: when invested capital is 0, the capital charge is 0 and economic profit is equal to NOPLAT.

In the same way, the ratio of economic profit over revenues can help in benchmarking the performance of DiversiCo's business units with peers of different size and capital intensity. For example, assume that most of DiversiCo's hardware business competitors have outsourced their entire manufacturing process. As a result, they have much lower capital intensity than DiversiCo's business but also generate lower earnings margins. Comparing ROICs is pointless, and economic profit will differ with the size of the competitors. Instead, comparing economic profit over revenues best reveals how DiversiCo's hardware business performs relative to its peers.

In general, when you are comparing the performance of businesses with very different capital intensity and size, using economic profit over revenues provides the best insights into performance and value creation.

SUMMARY

For most businesses, ROIC is a good measure of return on capital. It accurately reflects the economic return, as defined by the internal rate of return of the cash flows that the business generates. In addition, it is derived from information that is readily available from standard financial reports, and it is easy for managers to understand. But in some cases, an alternative measure of return on capital can provide better insights into value creation.

For businesses that rely on significant investments in intangibles, such as R&D or brands, you should adjust ROIC to include the capitalized value of these resources. For businesses that use very little or no capital, economic profit is a better measure of value creation. To allow for comparison across businesses of different sizes, you can scale economic profit by revenues. For businesses with high up-front investments in capital that generate steady cash flows for many years, you can consider whether measures such as CFROI justify the additional effort and complexity relative to ROIC.

22

Inflation

High-inflation environments make analyzing and forecasting companies' financial performance a challenge. Inflation distorts the financial statements, adding to the difficulty of year-to-year historical comparisons, ratio analyses, and performance forecasts.

When inflation is high, analysis and valuation depend on insights from both nominal- and real-terms approaches. Sometimes nominal indicators are not useful (e.g., for capital turnover). In other cases, real indicators are problematic (e.g., when determining corporate income taxes). But when properly applied, valuations in real and nominal terms should yield an identical value.

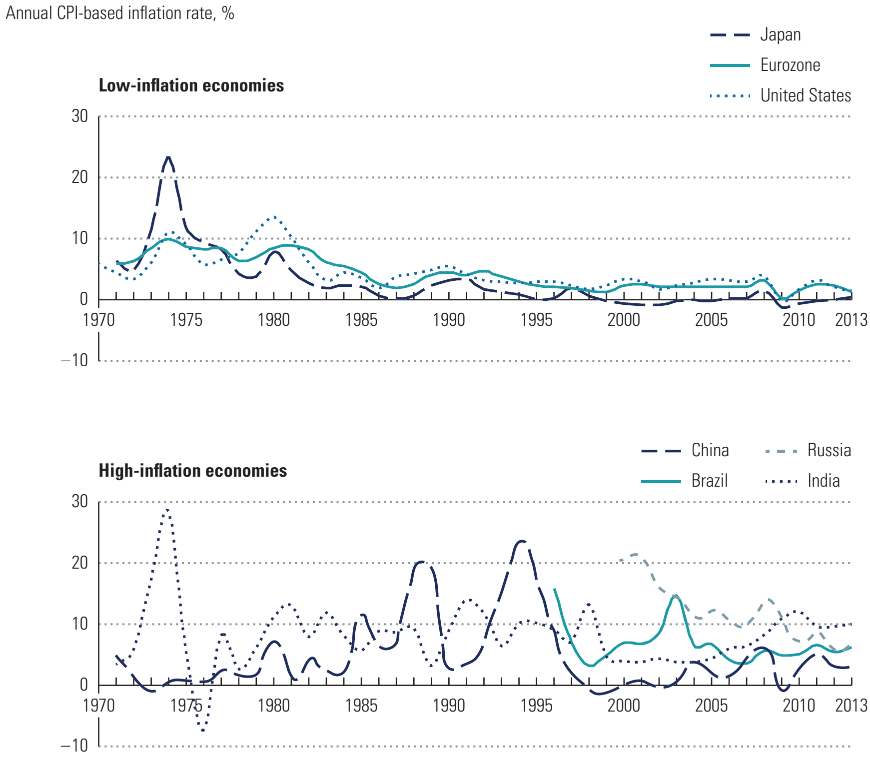
Although all the familiar tools described in Part Two still apply to periods of high inflation, such times cause particular complications. This chapter discusses the following issues:

- How inflation leads to lower value creation in companies, because it erodes real-terms free cash flow (FCF), as companies don't increase prices enough to overcome higher capital costs as well as operating costs
- How to evaluate a company's historical performance when inflation is high
- How to prepare financial projections of a company's performance in both nominal and real terms

INFLATION LEADS TO LOWER VALUE CREATION

Since the 1980s, inflation has generally been mild in the developed economies of Europe and North America, at levels around 2 to 3 percent per year. But this does not mean inflation has become irrelevant. As Exhibit 22.1 shows, the situation was quite different in the 1970s, when inflation hovered around 10 percent for the same economies. Some economists warn of a return to such

EXHIBIT 22.1 **Historical Inflation Rate in Developed and Emerging Economies**



Source: World Market Monitor.

levels as government deficits have risen rapidly across developed economies.[1] And in many of the fast-growing economies of Latin America and Asia, such as the BRIC countries (Brazil, Russia, India, and China), inflation has been at double-digit levels for many years. In stark contrast, Japan has experienced extremely low inflation and even deflation since the early 1990s.

Inflation often persists, stretching over several years as it did during the 1970s and 1980s, because suppressing it requires strict and unpopular government measures. For example, curbing inflation caused by overheating in the economy typically requires increasing interest rates and reducing public spending to dampen growth. In most cases, such measures are undertaken only when everything else has failed and when inflation has become too high to ignore—but even more difficult to fix.

[1]See, for example, M. Feldstein, "The Fed Must Reassure Markets on Inflation," *Financial Times*, June 28, 2009.

It's necessary to take account of persistent inflation in analysis and valuation because a large body of academic research clearly shows that inflation is negatively correlated with stock market returns.[2] To illustrate, as inflation increased from around 2 to 3 percent in the late 1960s to around 10 percent in the second half of the 1970s, the average price-to-earnings (P/E) ratio for companies in the United States declined from around 18 to below 10. When inflation finally came down, from 1985 onward, P/Es returned to their historical levels.

Inflation has a number of obvious pernicious effects on value creation. Academic research has found evidence that investors often misjudge inflation, which pushes up the cost of capital in real terms and depresses market valuations.[3] Inflation creates a one-off loss in value for companies with so-called net monetary assets—that is, asset positions that are fixed in nominal terms.[4] For example, a balance of receivables loses 10 percent in value when inflation unexpectedly increases by 10 percent. The reverse holds for net monetary liabilities, such as fixed-rate debt. Depending on the relative size of a particular company's receivables, payables, and debt, the direct effect could be positive or negative. Companies also can end up paying higher taxes if their depreciation tax shields are not inflation-adjusted for tax purposes—and this is typically the case.

Inflation's most value-destroying impact is not obvious. Though companies may increase prices, most cannot or do not increase them enough to cover not only their higher operating costs (salaries and purchased goods) but also the higher cost of future capital expenditures. As a result, they fail to maintain profitability in real terms.

To understand how significant the challenge can be of passing on cost increases, consider this simple example. Assume a company generates steady sales of $1,000 per year. Earnings before interest, taxes, and amortization (EBITA) are $100, and invested capital is $1,000. Assume the asset base is evenly spread across 15 groups with remaining lifetimes of 1 to 15 years. Gross property, plant, and equipment (PP&E) is $1,875, and annual capital expenditures equal depreciation charges at $125.[5] The company's key financials would be as shown in Exhibit 22.2. If the cost of capital is 8 percent, the

[2]See, for example, E. Fama and G. Schwert, "Asset Returns and Inflation," *Journal of Financial Economics* 5 (1977): 115–146; and J. Ritter and R. Warr, "The Decline of Inflation and the Bull Market of 1982–1999," *Journal of Financial and Quantitative Analysis* 37, no. 1 (2002): 29–61.

[3]See, for example, F. Modigliani and R. Cohn, "Inflation, Rational Valuation, and the Market," *Financial Analysts Journal* 35 (1979): 24–44; and Ritter and Warr, "The Decline of Inflation," who found that in times of high inflation, investors tend to capitalize real cash flows at nominal discount rates.

[4]See, for example, H. Hong, "Inflation and the Market Value of the Firm: Theory and Test," *Journal of Finance* 32, no. 4 (1977): 1031–1048.

[5]At the end of each year, after replacement of the asset group that is fully depreciated, the average remaining life of assets is exactly eight years. Annual depreciation is therefore $1,000 ÷ 8 = $125, and gross PP&E equals 15 × $125 = $1,875.

EXHIBIT 22.2 **Financial Projections without Inflation**

$

	Year 1	Year 2	Year 3	Year 4	...	Year 16	Year 17	...
Sales	1,000	1,000	1,000	1,000	...	1,000	1,000	...
EBITDA[1]	225	225	225	225	...	225	225	...
Depreciation	(125)	(125)	(125)	(125)	...	(125)	(125)	...
EBITA[2]	100	100	100	100	...	100	100	...
Gross property, plant, and equipment	1,875	1,875	1,875	1,875	...	1,875	1,875	...
Cumulative depreciation	(875)	(875)	(875)	(875)	...	(875)	(875)	...
Invested capital	1,000	1,000	1,000	1,000	...	1,000	1,000	...
EBITDA	225	225	225	225	...	225	225	...
Capital expenditures	(125)	(125)	(125)	(125)	...	(125)	(125)	...
Free cash flow (FCF)	100	100	100	100	...	100	100	...
EBITA growth, %	–	–	–	–	...	–	–	...
EBITA/sales, %	10.0	10.0	10.0	10.0	...	10.0	10.0	...
Return on invested capital, %	10.0	10.0	10.0	10.0	...	10.0	10.0	...
FCF growth, %	–	–	–	–	...	–	–	...

[1] Earnings before interest, taxes, depreciation, and amortization.
[2] Earnings before interest, taxes, and amortization.

discounted-cash-flow (DCF) value at the start of year 2—or any year—equals:

$$\text{DCF} = \frac{\$100}{(8\% - 0\%)} = \$1,250$$

Now assume that in year 2, inflation suddenly increases to 15 percent and stays at that level in perpetuity, affecting costs and capital expenditures equally. Let's assume the company increases prices enough that its EBITA grows with inflation and its sales margin (EBITA divided by sales) remains at 10 percent while keeping sales volume and physical production capacity constant. In the process, the company even succeeds in lifting its return on invested capital (ROIC) to almost 20 percent after 15 years (see Exhibit 22.3).

Although these results may be impressive at first sight, a closer inspection of the financial performance reveals significant value destruction. Even though EBITA grows at 15 percent per year, earnings before interest, taxes, depreciation, and amortization (EBITDA) grow at only 7 to 8 percent per year because depreciation is recorded at historical nominal cost. As a result, capital spending exceeds depreciation when keeping physical capacity constant, leading to an actual decline in free cash flow (FCF) in the first few years. FCF growth only gradually rises to the rate of inflation in year 17.[6] Combine this with a cost of

[6]Given our assumption of an asset lifetime of 15 years, FCF growth gradually increases from 0 to 15 percent until year 17, when a new steady state is reached if inflation remains constant.

EXHIBIT 22.3 **Financial Projections with Inflation and Incomplete Inflation Pass-On**

$

	Year 1	Year 2	Year 3	Year 4	...	Year 16	Year 17	...
Sales	1,000	1,131	1,283	1,460	...	7,516	8,644	...
EBITDA	225	240	259	281	...	1,210	1,392	...
Depreciation	(125)	(125)	(126)	(129)	...	(397)	(456)	...
EBITA	100	115	132	152	...	814	936	...
Gross property, plant, and equipment	1,875	1,894	1,934	1,999	...	6,840	7,866	...
Cumulative depreciation	(875)	(875)	(876)	(880)	...	(2,082)	(2,394)	...
Invested capital	1,000	1,019	1,058	1,119	...	4,758	5,472	...
EBITDA	225	240	259	281	...	1,210	1,392	...
Capital expenditures	(125)	(144)	(165)	(190)	...	(1,017)	(1,170)	...
Free cash flow (FCF)	100	96	93	91	...	193	222	...
EBITA growth, %	–	15.0	15.0	15.0	...	15.0	15.0	...
EBITA/sales, %	10.0	10.2	10.3	10.4	...	10.8	10.8	...
Return on invested capital, %	10.0	11.5	13.0	14.4	...	19.7	19.7	...
FCF growth, %	–	–3.7	–3.2	–2.4	...	14.3	15.0	...

capital increase to 24 percent[7] and the company's value plummets. An explicit DCF valuation with continuing value estimated as of year 17 would show the value at the start of year 2 being as low as $481.

To pass on inflation to customers in full without losing sales volume, the company must increase its *cash flows*, not its earnings, at 15 percent per year (see Exhibit 22.4). In this case, the DCF value at the start of year 2 is fully preserved:

$$\text{DCF} = \frac{\$115}{(24\% - 15\%)} = \$1,250$$

But having all cash flows grow with inflation means that earnings must increase much faster than inflation. As the summary financials show, EBITA growth is now more than 33 percent in year 2. In the same year, the sales margin increases from 10.0 to 11.6 percent, and ROIC increases from 10.0 to 13.4 percent. After 15 years of constant inflation, the sales margin and ROIC would end up at 17.6 percent and 34.7 percent, respectively. ROIC needs to rise this far to keep up with inflation and the higher cost of capital.[8]

[7]With inflation at 15 percent, the cost of capital increases from 8 percent to (1 + 8%) × (1 + 15%) – 1 = 24%.

[8]The reason is that invested capital and depreciation do not grow with inflation immediately. For example, in year 2, annual capital expenditures increase by 15 percent, but this adds only 15% × $125 = $18.75 to invested capital. Assets are acquired at the end of each year and depreciated for the first time in the next year. Annual depreciation changes in year 3 by only a small amount: 1/15 × 19 = 1.25. In each year,

EXHIBIT 22.4 **Financial Projections with Inflation and Full Inflation Pass-On**

$

	Year 1	Year 2	Year 3	Year 4	. . .	Year 16	Year 17	. . .
Sales	1,000	1,150	1,323	1,521	. . .	8,137	9,358	. . .
EBITDA	225	259	298	342	. . .	1,831	2,105	. . .
Depreciation	(125)	(125)	(126)	(129)	. . .	(397)	(456)	. . .
EBITA	100	134	171	213	. . .	1,434	1,649	. . .
Gross property, plant, and equipment	1,875	1,894	1,934	1,999	. . .	6,840	7,866	. . .
Cumulative depreciation	(875)	(875)	(876)	(880)	. . .	(2,082)	(2,394)	. . .
Invested capital	1,000	1,019	1,058	1,119	. . .	4,758	5,472	. . .
EBITDA	225	259	298	342	. . .	1,831	2,105	. . .
Capital expenditures	(125)	(144)	(165)	(190)	. . .	(1,017)	(1,170)	. . .
Free cash flow (FCF)	100	115	132	152	. . .	814	936	. . .
EBITA growth, %	–	33.7	28.1	24.5	. . .	15.1	15.0	. . .
EBITA/sales, %	10.0	11.6	13.0	14.0	. . .	17.6	17.6	. . .
Return on invested capital, %	10.0	13.4	16.8	20.2	. . .	34.7	34.7	. . .
FCF growth, %	–	15.0	15.0	15.0	. . .	15.0	15.0	. . .

Although this example is stylized, the conclusion applies to all companies: after each acceleration in inflation, we should expect reported earnings to outpace inflation, and reported sales margin and ROIC to increase—even though, in real terms, nothing has changed. Unfortunately, history shows that in periods of inflation, companies do not achieve such big improvements in reported return on invested capital. ROICs remained in the range of 7 to 12 percent in the United States during the 1970s and 1980s, when inflation was at 10 percent or more. If companies had succeeded in passing on inflation effects, they should have reported much higher ROICs in those years. Instead, they hardly managed to keep returns at preinflation levels.

One likely cause is that companies cannot pass on the cost increases to customers without losing volume, or they can pass on increases only with some time lag. Another reason could be that managers do not sufficiently adjust targets for growth of earnings and sales margin when faced with inflation. If a company keeps its sales margins and ROIC constant in times of inflation, cash flows and value are eroding in real terms. Maintaining EBITA growth in line with inflation is also insufficient to sustain a company's value; this is even more the case for a leveraged indicator such as earnings per share.

the company replaces only 1/15 of assets at inflated prices, so it takes 15 years of constant inflation to reach a steady state where capital and depreciation grow at the rate of inflation. As the example shows, sales margin and ROIC increase each year until the steady state in year 17.

Whatever the exact reason, history shows that companies do not manage to pass on inflation in full. As a result, their cash flow in real terms declines. In addition, there is empirical evidence that in times of inflation, investors are likely to undervalue stocks as they misjudge inflation's effects.[9] Lower cash flow and higher cost of capital form a proven recipe for lower share prices, just as occurred in the 1970s and 1980s.

HISTORICAL ANALYSIS IN TIMES OF HIGH INFLATION

In countries experiencing extreme inflation (more than 25 percent per year), companies often report in year-end currency. In the income statement, items such as revenues and costs that were booked throughout the year are restated at year-end purchasing power. Otherwise, the addition of these items would have no relevance. The balance sheet usually has adjustments to fixed assets, inventory, and equity; the accounts payable and receivables are already in year-end terms.

In most countries, however, financial statements are not adjusted to reflect the effects of inflation. High inflation leads to distortions in the balance sheet and income statement. In the balance sheet, nonmonetary assets, such as inventories and PP&E, are shown at values far below current replacement value. In the income statement, depreciation charges are too low relative to current replacement costs. Sales and costs in December and January of the same year are typically added as if they represented the same purchasing power.

As a result, many financial indicators typically used in historical analyses can be distorted when calculated directly from the financial statements in high-inflation economies. In such circumstances, companies often index their internal management accounts to overcome these issues. If they do not, or if you are doing an outside-in analysis, at least correct for the following distortions:

- Growth is overstated in times of inflation, so restate it in real terms by deflating with an annual inflation index if sales are evenly spread across the year. If sales are not spread evenly, use quarterly or monthly inflation indexes to deflate the sales in each corresponding interval.
- Capital turnover is typically overstated because operating assets are carried at historical costs. You can approximate the current costs of long-lived assets by adjusting their reported values with an inflation index for their estimated average lifetimes. Or consider developing ratios of real sales relative to physical-capacity indicators appropriate for the sector—for example, sales per square meter in consumer retail. Inventory levels also need restating if turnover is low and inflation is very high.

[9] Modigliani and Cohn, "Inflation, Rational Valuation, and the Market"; Ritter and Warr, "The Decline of Inflation."

- Operating margins (operating profit divided by sales) can be overstated because depreciation is too low and slow-moving inventories make large nominal holding gains. Corrections for depreciation charges follow from adjustments to PP&E. You can estimate cash operating expenses at current-cost basis by inflating the reported costs for the average time held in inventory. Alternatively, use historical EBITDA-to-sales ratios to assess the company's performance relative to peers; these ratios at least do not suffer from any depreciation-induced bias.
- Credit ratios and other indicators of capital structure health become distorted and require cautious interpretation. Distortions are especially significant in solvency ratios such as debt to equity or total assets, because long-lived assets are understated relative to replacement costs, and floating-rate debt is expressed in current currency units. As Chapter 29 advises, use coverage ratios such as EBITDA to interest expense.[10] These are less exposed to accounting distortions, because depreciation has no impact on them and debt financing is mostly at floating rates or in foreign currency when inflation is persistent.

FINANCIAL PROJECTIONS IN REAL AND NOMINAL TERMS

When you make financial projections of income statements and balance sheets for a valuation in a high-inflation environment, keep in mind that accounting adjustments should not affect free cash flow. Projections are typically made in either nominal or real terms, but high-inflation environments require a hybrid approach because each single approach has drawbacks, as Exhibit 22.5 shows. On the one hand, projecting in real terms makes it difficult to calculate taxes correctly, as tax charges are often based on nominal financial statements. Furthermore, you need to project explicitly the effects of working-capital changes on cash flow because these do not automatically follow from the annual change in real-terms working capital. On the other hand, using nominal cash flows makes future capital expenditures difficult to project, because the typically stable relationship between revenues and fixed assets does not hold in times of high inflation. This means it will also be difficult to project depreciation charges and EBITA.

To prepare consistent financial projections, you therefore need to use elements of both nominal and real forecasts. This section illustrates how to combine the two approaches in a DCF valuation. The example considers a company whose revenues grow at 2 percent in real terms while the annual inflation rate

[10]Distortions occur in the ratio of EBITA to interest coverage if operating profit is overstated due to low depreciation charges and low costs of procured materials.

EXHIBIT 22.5 **Combining Real and Nominal Approaches to Financial Modeling**

✓✓ Preferred application

	Modeling approach	
Estimates	**Real**	**Nominal**
Operational performance		
Sales	✓✓	✓
EBITDA	✓✓	✓
EBITA	✓✓	
Capital expenditures	✓✓	
Investments in working capital	✓✓[1]	✓
Other		
Income taxes		✓✓
Financial statements	✓[2]	✓✓
Continuing value	✓✓[1]	✓✓

[1] If inflation impact on investments in working capital is explicitly included.
[2] If inflation corrections are separately modeled and included in income statement and balance sheet.

EXHIBIT 22.6 **DCF under Inflation: Operational and Financial Assumptions**

		Forecasts					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**...**	**Year 25**
Operational assumptions							
Real growth rate, %	2	2	2	2	2		–
Real revenues, $	1,000	1,020	1,040	1,061	1,082	...	1,608
Real EBITDA, $	300	306	312	318	325	...	483
Net working capital/revenues, %	20	20	20	20	20	...	20
Real net PP&E/real revenues, %	40	40	40	40	40	...	40
Lifetime of net PP&E, years	5	–	–	–	–	...	–
Financial assumptions							
Inflation rate, %	–	20	10	10	10	...	10
Inflation index	1.00	1.20	1.32	1.45	1.60	...	10.75
Tax rate, %	35	35	35	35	35	...	35
Real WACC, %	–	8.0	8.0	8.0	8.0	...	8.0
Nominal WACC, %	–	29.6	18.8	18.8	18.8	...	18.8

Note: Adjusted formula for real-terms continuing value.

is 20 percent in the first forecast year and 10 percent thereafter (see Exhibit 22.6). To simplify, we assume that all cash flows occur at the end of the year.[11]

In practice, financial projections for high-inflation valuations raise many more issues than in this simplified example. Nevertheless, the example is useful for showing how to address some key issues when developing a cash flow forecast in periods of inflation. Using the following step-by-step approach leads to the real and nominal valuation results shown in Exhibit 22.7.

[11] At extremely high, fluctuating levels of inflation, however, this assumption could distort financial projections, because the cash flows that accumulate throughout the year are subject to different inflation rates. In such cases, split the year into quarterly or even monthly intervals, project cash flows for each interval, and discount the cash flows at the appropriate discount rate for that interval.

EXHIBIT 22.7 **DCF under Inflation: Real and Nominal Models**

	Real projections							Nominal projections						
	Year 1	Year 2	Year 3	Year 4	Year 5	...	Year 25	Year 1	Year 2	Year 3	Year 4	Year 5	...	Year 25
NOPLAT, $ million														
Revenues	1,000	1,020	1,040	1,061	1,082	...	1,608	1,000	1,224	1,373	1,541	1,729	...	17,283
EBITDA	300	306	312	318	325	...	483	300	367	412	462	519	...	5,185
Depreciation	(80)	(80)	(82)	(83)	(85)	...	(126)	(80)	(80)	(85)	(92)	(100)	...	(926)
EBITA	220	226	231	235	240	...	356	220	287	327	370	419	...	4,259
Taxes	(77)	(84)	(87)	(89)	(92)	...	(139)	(77)	(101)	(114)	(130)	(147)	...	(1,491)
NOPLAT[1]	143	142	144	146	148	...	218	143	187	212	241	272	...	2,768
Free cash flow, $ million														
NOPLAT	143	142	144	146	148	...	218	143	187	212	241	272	...	2,768
Depreciation	80	80	82	83	85	...	126	80	80	85	92	100	...	926
Capital expenditures	(80)	(88)	(90)	(92)	(93)	...	(139)	(80)	(106)	(118)	(133)	(149)	...	(1,491)
Investment in net working capital	–	(37)	(23)	(23)	(24)	...	(35)	–	(45)	(30)	(34)	(38)	...	(376)
Free cash flow	–	97	113	114	116	...	170	–	116	149	166	185	...	1,827
Invested capital, $ million														
Net PP&E (beginning of year)	400	400	408	416	424	...	631	400	400	426	459	500	...	4,631
Depreciation	(80)	(80)	(82)	(83)	(85)	...	(126)	(80)	(80)	(85)	(92)	(100)	...	(926)
Capital expenditures	80	88	90	92	93	...	139	80	106	118	133	149	...	1,491
Net PP&E (end of year)	400	408	416	424	433	...	643	400	426	459	500	549	...	5,196
Net working capital	200	204	208	212	216	...	322	200	245	275	308	346	...	3,457
Invested capital	600	612	624	637	649	...	965	600	670	734	808	895	...	8,653
Ratios, %														
Net PP&E/revenues	–	40	40	40	40	...	40	–	35	33	32	32	...	30
Net working capital/revenues	–	20	20	20	20	...	20	–	20	20	20	20	...	20
ROIC	–	24	24	23	23	...	23	–	31	32	33	34	...	36
FCF growth rate	–	–	17	1	1	...	2	–	–	28	11	12	...	12
DCF valuation, $ million														
Free cash flow	–	97	113	114	116	...	170	–	116	149	166	185	...	1,827
Continuing value (value driver formula)[2]	–	–	–	–	–	...	2,891	–	–	–	–	–	...	31,063
Continuing value (cash flow perpetuity formula)	–	–	–	–	–	...	2,891	–	–	–	–	–	...	31,064
Present value factor	–	0.93	0.86	0.79	0.74	...	0.16	–	0.77	0.65	0.55	0.46	...	0.01
DCF value	1,795	–	–	–	–	...	–	1,795	–	–	–	–	...	–

[1] Net operating profit less adjusted taxes.
[2] Adjusted formula for real-terms continuing value.

Step 1: Forecast Operating Performance in Real Terms

To the extent possible, convert historical nominal balance sheets and income statements into real terms (usually at the current year's currency value). At a minimum, make a real-terms approximation of the historical development of the key value drivers—growth and return on capital—and the underlying capital turnover and EBITA margin, so you can understand the true economics of the business. With these approximations, forecast the operating performance of the business in real terms:

- Project future revenues and cash expenses to obtain EBITDA forecasts.[12]
- Estimate PP&E and capital expenditures from your assumptions for real-terms capital turnover.
- Working capital follows from projected revenues and assumptions on days of working capital required.
- From projected net PP&E and assumptions on the lifetime of the assets, derive the annual depreciation to estimate real-terms EBITA.

Step 2: Build Financial Statements in Nominal Terms

Nominal projections can be readily derived through the following steps, which convert the real operating projections into nominal terms:[13]

- Project nominal revenues, cash expenses, EBITDA, and capital expenditures by multiplying their real-terms equivalents by an estimated inflation index for the year.
- Estimate net PP&E on a year-by-year basis from the prior-year balance plus nominal capital expenditures minus nominal depreciation (which is estimated as a percentage of net PP&E according to the estimated asset lifetime).
- Working capital follows from revenues and days of working capital required.
- Subtract the nominal depreciation charges from EBITDA to obtain nominal EBITA.
- Calculate income taxes on nominal EBITA without inflation corrections, unless tax laws allow for such corrections.

[12] This step assumes that all expenses included in EBITDA are cash costs.

[13] As noted, these projections are made for valuation purposes and not necessarily in accordance with local or international accounting standards prescribing any inflation or monetary corrections for particular groups of assets and liabilities under, for example, inflation accounting. Free cash flows would not be affected by such adjustments.

This example did not build a complete balance sheet and income statement. Complete financial statements would be needed for major decisions concerning, for example, dividend policy and capital structure, debt financing, and share repurchase. Developing complete nominal financial statements would require the following additional steps:

- Forecast interest expense and other nonoperating income statement items in nominal terms (based on the previous year's balance sheet).
- Check that equity equals last year's equity plus earnings, less dividends, plus or minus any share issues or repurchases.
- Balance the balance sheet with debt or marketable securities.

Step 3: Build Financial Statements in Real Terms

Most of the operating items for the real-terms income statement and balance sheet were already estimated in step 1. Now include the real-terms taxes on EBITA by deflating the nominal taxes as estimated in step 2. For full financial statements, use the inflation index to convert debt, marketable securities, interest expense, income taxes, and nonoperating terms from the nominal statements into real terms. The real-terms equity account is a plug to balance the balance sheet. To make sure you have done this correctly, be sure the real equity account equals last year's equity plus earnings, less dividends, plus or minus share issues or repurchases, and plus or minus inflationary gains or losses on the monetary assets (such as cash, receivables, payables, and debt). Note that the projections in nominal terms, in contrast to those in real terms, show capital turnover increasing over time because nominal revenues grow faster than net PP&E in a high-inflation environment.

Step 4: Forecast Free Cash Flows in Real and Nominal Terms

Forecast the future free cash flows in real and nominal terms from the projected income statements and balance sheets. Follow the general approach described in Chapter 8. The only difference is that the real-terms investment in net working capital (NWC^R) is equal to the increase in working capital plus a monetary loss due to inflation:[14]

$$\text{Investment in NWC}_t^R = \text{Increase in NWC}_t^R + \text{NWC}_{t-1}^R\left(1 - \frac{\text{IX}_{t-1}}{\text{IX}_t}\right)$$

where IX_t is the inflation index for the year t.

[14]Even for assets held at constant levels in real-terms balance sheets, replacement investments are required at increasing prices in an inflationary environment. These replacement investments represent a cash outflow, also in real terms, but do not show up from real-terms balance sheet differences from year to year. In contrast, the nominal investment cash flow does follow from the nominal balance sheet differences from year to year.

To check for consistency, use the inflation index to convert the free cash flows from the nominal projections to real terms. These should equal the free cash flows from the real-terms projections in each year.

Step 5: Estimate DCF Value in Real and Nominal Terms

When discounting real and nominal cash flows under high inflation, you must address three key issues:

1. Ensure that the weighted average cost of capital estimates in real terms (WACC^R) and nominal terms (WACC^N) are defined consistently with the assumptions for inflation (i) in each year:

$$1 + \text{WACC}_t^\text{N} = (1 + \text{WACC}_t^\text{R})(1 + i_t)$$

2. Make sure the explicit forecast period is long enough for the model to reach a steady state with constant growth rates of free cash flow in the year when you apply the continuing-value formula. Because of the way inflation affects capital expenditures and depreciation, you need a much longer horizon than for valuations with no or low inflation.
3. The value driver formula as presented in Chapter 12 can be readily applied when estimating continuing value in nominal terms, but it should be adjusted when estimating in real terms in high-inflation environments. The returns on capital in real-terms projections (ROIC^R) overestimate the economic returns in the case of positive net working capital. The free cash flow in real terms differs from the cash flow implied by the value driver formula by an amount equal to the annual monetary loss on net working capital:

$$\text{FCF}_t^\text{R} = \left(1 - \frac{g_t^\text{R}}{\text{ROIC}_t^\text{R}}\right)\text{NOPLAT}_t^\text{R} - \text{NWC}_{t-1}^\text{R}\left(1 - \frac{\text{IX}_{t-1}}{\text{IX}_t}\right)$$

where g^R is growth rate in real terms, and NOPLAT^R is net operating profit less adjusted taxes in real terms. The real-terms value driver formula is adjusted for this monetary loss, reflecting the perpetuity assumptions for inflation (i) and the ratio of net working capital to invested capital ($\text{NWC}^\text{R}/\text{IC}^\text{R}$):

$$\text{CV}^\text{R} = \frac{\left(1 - \frac{G^\text{R}}{\text{ROIC}^\text{R}}\right)\text{NOPLAT}^\text{R}}{\text{WACC}^\text{R} - g^\text{R}}$$

where

$$G^R = g^R + \left[\frac{\text{NWC}^R}{\text{IC}^R}\left(\frac{i}{1+i}\right)\right]$$

The resulting continuing-value estimate is the same as that obtained from an FCF perpetuity growth formula. After indexing for inflation, it also equals the continuing-value estimates derived from nominal projections.

Of course, the DFC valuations in nominal and real terms should lead to exactly the same result. Combining both approaches not only provides additional insights into a company's economics under inflation but also is a useful cross-check on the validity of the valuation outcomes.

SUMMARY

High and persistent inflation destroys value because companies typically cannot increase prices enough to offset higher capital outlays. To analyze and value companies in the presence of such inflation, we use the same tools and approaches as introduced in Part Two. However, applying them can be somewhat different.

When analyzing a company's historical performance, you should be aware that persistent inflation can distort many familiar financial indicators, such as growth, capital turnover, operating margins, and solvency ratios. Ensure that you make appropriate adjustments to these ratios. When making financial projections, use a combined nominal- and real-terms approach, because real-terms and nominal-terms projections offer relevant insights and can be used for cross-checking your results. When discounting cash flows, use inflation assumptions in the weighted average cost of capital that are fully consistent with those underlying your cash flow projections.

23

Cross-Border Valuation

To value businesses, subsidiaries, or companies in foreign countries, follow the same principles and methods that we presented in Part Two. Fortunately, cross-border valuations have become simpler over the past few years as international accounting differences have rapidly diminished. Most of the world's major economies have now adopted either International Financial Reporting Standards (IFRS) or U.S. Generally Accepted Accounting Principles (GAAP), and these two standards are rapidly converging. Moreover, remember that if you follow the recommendations for rearranging financial statements in Chapter 9, you will obtain identical results regardless of which accounting principles you follow in preparing the financial statements.

Nevertheless, the following issues arise in cross-border valuations and still need special attention:

- Forecasting cash flows, whether in foreign currency (the currency of the foreign entity to be valued) or domestic currency (the home currency of the person performing the valuation)
- Estimating the cost of capital
- Incorporating foreign-currency risk in valuations
- Using translated foreign-currency financial statements

This chapter highlights the steps involved in the special analyses required for each of these issues.

FORECASTING CASH FLOWS

A company or business unit valuation should always result in the same value regardless of the currency or mix of currencies in which cash flows are projected. To achieve this consistent outcome, you should use consistent monetary assumptions and one of the following two methods for forecasting and discounting cash flows denominated in foreign currency:

EXHIBIT 23.1 **Projecting and Discounting Foreign Cash Flows**

		2016	2017	2018	2019	2020	2021
Foreign currency, Swiss francs	**Cash flows**						
	Nominal cash flow	103.0	106.6	110.9	115.4	120.1	124.9
	Real cash flow	102.5	105.6	109.3	113.7	118.3	123.1
	Inflation, %	0.50	1.00	1.50	1.50	1.50	1.50
	Interest rates, %						
	Real interest rate	3.00	3.00	3.00	3.00	3.00	3.00
	Nominal forward interest rate	3.52	4.03	4.55	4.55	4.55	4.55
	Nominal interest yield	3.52	3.77	4.03	4.16	4.24	4.29
Foreign-exchange rates, Swiss francs/€	Spot exchange rate 1.200						
	Forward exchange rate	1.194	1.188	1.177	1.165	1.154	1.137
Domestic currency, €	**Interest rates**, %						
	Nominal interest yield	4.03	4.29	4.71	4.93	5.06	5.23
	Nominal forward interest rate	4.03	4.55	5.58	5.58	5.58	6.09
	Real interest rate	3.00	3.00	3.00	3.00	3.00	3.00
	Inflation, %	1.00	1.50	2.50	2.50	2.50	3.00
	Cash flows						
	Real cash flow	85.4	88.4	92.0	96.7	101.5	106.7
	Nominal cash flow	86.3	89.8	94.3	99.1	104.1	109.9

1. *Spot-rate method:* Project foreign cash flows in the foreign currency, and discount them at the foreign cost of capital. Then convert the present value of the cash flows into domestic currency, using the spot exchange rate.
2. *Forward-rate method:* Project foreign cash flows in the foreign currency, and convert these into the domestic currency using the relevant forward exchange rates. Then discount the converted cash flows at the cost of capital in domestic currency.

Let's use a simple example to illustrate both methods. Assume you want to estimate the value of a Swiss subsidiary for its German parent company as of 2015. Exhibit 23.1 shows the cash flow projections for the subsidiary in the foreign currency (Swiss francs).

The nominal cash flows grow at 3 percent per year in real terms plus inflation, which is projected to increase from 0.5 to 1.5 percent per year until 2021. Note that this inflation projection is consistent with the interest rates shown. For example, in 2017, the forward interest rate equals the real interest rate plus the expected inflation rate for that year:

$$(1 + 3.00\%)\,(1 + 1.00\%) - 1 = 4.03\%$$

And the two-year interest rate (yield) as of 2015 is the geometric average of the first- and second-year nominal forward interest rates:

$$[(1 + 3.52\%)\,(1 + 4.03\%)]^{1/2} - 1 = 3.77\%$$

Using the *spot-rate method*, simply project cash flows in Swiss francs (CHF), and discount them at the Swiss risk-free interest rates. (We assume the subsidiary's beta is zero.) The resulting present value is 589.9 Swiss francs. Converting this value at the spot exchange rate of 1.200 Swiss francs per euro results in a discounted-cash-flow (DCF) value of €491.6 million:

		Year					
Spot-rate method		**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Cash flow, CHF, million		103.0	106.6	110.9	115.4	120.1	124.9
Discount factor		0.966	0.929	0.888	0.850	0.813	0.777
Present value of cash flow, CHF, million		99.5	99.0	98.6	98.1	97.6	97.1
DCF value, CHF, million	589.9						
DCF value, € million	**491.6**						

The *forward-rate method* is more complex. The projected cash flows in Swiss francs should be converted to euros on a year-by-year basis using forward rates and then discounted at euro interest rates. For most currencies, however, forward exchange rates are not available beyond 18 months. This means you need to estimate synthetic forward exchange rates using interest rate parity theory.

Following the theory, the forward foreign-exchange rate in year t, X_t, equals the current spot rate, X_0, multiplied by the ratio of nominal interest rates in the two currencies over the forecast interval, t:

$$X_t = X_0 \left(\frac{1 + r^F}{1 + r^D} \right)^t$$

where r^F is the interest rate in foreign currency and r^D is the interest rate in domestic currency.

In Exhibit 23.1, the euro–Swiss franc forward exchange rates are consistent with interest rate parity. For example, as of January 2016, a German company can borrow four-year money in Switzerland at a 4.16 percent nominal interest rate, r^F, while the borrowing rate in euros, r^D, is 4.93 percent for the same period. The spot exchange rate, X_0, is 1.200 Swiss francs per euro. It is possible to use interest rate parity to estimate the three-year forward rate, X_3:

$$X_3 = 1.200 \left(\frac{1 + 4.16\%}{1 + 4.93\%} \right)^4 = 1.165$$

As these calculations show, whether a company borrows in Swiss francs or euros has no impact on value (unless there are any tax implications). If a German company borrows 1,200 Swiss francs today, it has to repay the loan with interest of 4.16 percent a year, totaling 1,412 Swiss francs in 2019. It can convert this total into a €1,212 payment in 2019 at today's four-year forward exchange rate (1,412 ÷ 1.165). Converting the borrowed amount of 1,200 Swiss francs at the current spot rate, the German company has effectively taken up a €1,000 loan, which is to be repaid with 4.93 percent annual interest, the euro interest rate on four-year money, totaling €1,212 in 2019.

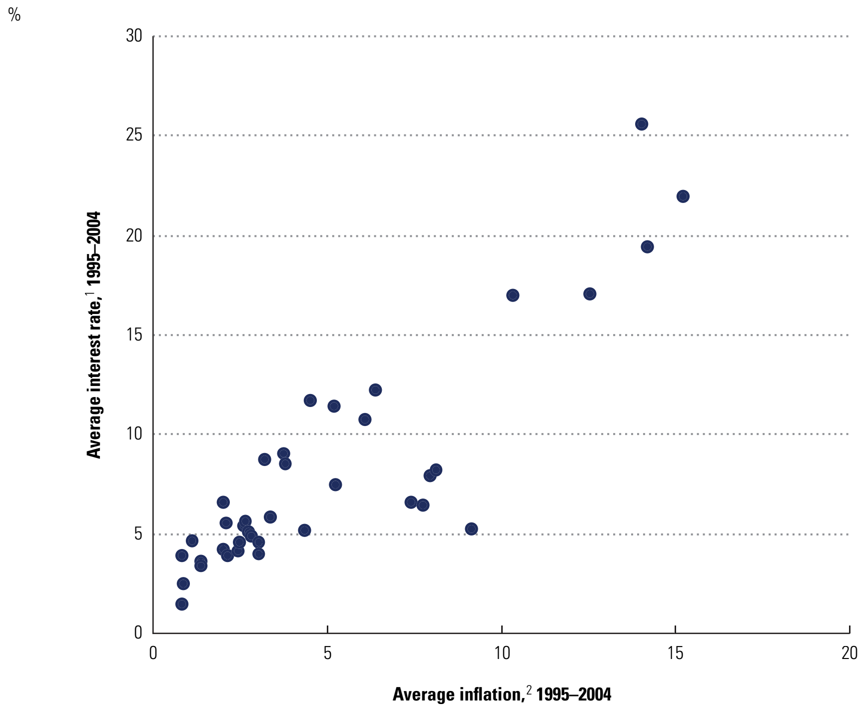
In the forward-rate method, the Swiss-franc cash flow projections are converted to euro cash flows by using the forward exchange rates (see Exhibit 23.1). Using the euro interest rates to discount the converted cash flows, we obtain a present value of €491.6 million, exactly the same value as obtained under the spot-rate method:

		Year					
Forward-rate method		**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Cash flow at forward exchange rate, € million		86.3	89.8	94.3	99.1	104.1	109.9
Discount factor		0.961	0.919	0.871	0.825	0.781	0.737
Present value of cash flow, € million		82.9	82.5	82.1	81.7	81.3	80.9
DCF value, € million	**491.6**						

Following the International Fisher relation,[1] differences in interest rates reflect the ratio of expected inflation rates between two currencies. Exhibit 23.2 plots the relationship between domestic inflation and domestic interest rates for 38 countries from 1995 to 2004. As the empirical results show, inflation differences explain most of the difference in nominal interest rates.

[1]See, for example, R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 11th ed. (Burr Ridge, IL: McGraw-Hill/Irwin, 2013), chap. 27.

EXHIBIT 23.2 **Relationship between Inflation and Interest Rates**



[1] Money market rate.
[2] Consumer price inflation.
Note: Sample of 38 countries in North and Latin America, Western and Eastern Europe, and Asia-Pacific.
Source: International Monetary Fund International Financial Statistics.

You could therefore also derive the forward exchange rate in year t, X_t, from the current spot rate, X_0, multiplied by the ratio of the rates of inflation for the two currencies over the forecast interval:

$$X_t = X_0 \left[\frac{\left(1 + i_1^F\right) \times \left(1 + i_2^F\right) \times \ldots \times \left(1 + i_t^F\right)}{\left(1 + i_1^D\right) \times \left(1 + i_2^D\right) \times \ldots \times \left(1 + i_t^D\right)} \right]$$

where i_t^D = inflation rate in year t in domestic currency
i_t^F = inflation rate in year t in foreign currency

For example, in Exhibit 23.1, the three-year forward rate equals:

$$X_3 = 1.200 \left[\frac{(1.005) \times (1.010) \times (1.015)}{(1.010) \times (1.015) \times (1.025)} \right] = 1.177$$

After conversion, the Swiss subsidiary's cash flows in euros differ from the original cash flows in Swiss francs by exactly the difference in inflation rates between the two currencies. Thus, the forward Swiss-franc-to-euro exchange rates are tied not only to the Swiss franc and euro interest rates, but also to the differences in Swiss-franc and euro expected future inflation rates.

When you project and discount cash flows in different currencies, you cannot make independent assumptions for inflation, interest rates, and forward exchange rates across currencies. To ensure that your valuation results do not change with the choice of currency of denomination for a business's cash flows, you need to ensure that your monetary assumptions for all the currencies involved are consistent, as follows:

- Inflation assumptions underlying cash flow projections in a specific currency need to be consistent with inflation assumptions underlying interest rates in that currency.
- Forward exchange rates between two currencies need to be consistent with inflation and interest rate differences between those currencies.
- Cash flow projections should be converted from one currency into another at forward exchange rates.

ESTIMATING THE COST OF CAPITAL

As when you are forecasting cash flows in different currencies, the most important rule when you are estimating costs of capital for cross-border valuations is to have consistent monetary assumptions. The expected inflation that determines the foreign-currency cash flows should equal the expected inflation included in the foreign-currency weighted average cost of capital (WACC) through the risk-free rate. Then estimate the cost of capital, depending on the investor's position.

For investors and companies that face little or no restriction on investing outside their home markets, the cost of capital is best estimated following a global capital asset pricing model (CAPM) that applies equally to foreign and domestic investments. This means that there is a single, real-terms risk-free rate and that the market risk premium and beta should be measured against a global market portfolio and not against a local (foreign or domestic) market portfolio. We recommend this approach because capital markets have become global, in the sense that a considerable share of all equity trades is now international, and global traders, primarily large institutional investors, draw their capital from and invest it all around the world.

For investors and companies in markets facing capital controls that prevent them from freely investing abroad, we recommend using a so-called local

CAPM. By definition, they can invest in domestic assets only and should estimate the cost of capital from a domestic perspective, measuring market risk premium and beta versus a (diversified) domestic portfolio. The following sections provide further background for our recommendations and practical guidelines for estimating the cost of capital in foreign currency.

CAPM: Global, International, or Local?

The standard CAPM introduced in Chapter 13 to estimate the cost of capital does not explicitly account for foreign assets, foreign investors, or currencies. The question arises whether such a model can provide the right cost of capital for investments in foreign currencies. If foreign-currency rates are changing, the same investment will generate different returns to investors from different countries. For example, a German government bond denominated in euros generates a risk-free return from the perspective of a German or Dutch investor for whom the euro is also the domestic currency (assuming there is no inflation). But the bond's return is not risk-free for investors in the United States, as the return measured in U.S. dollars will vary with the dollar-to-euro exchange rate. As a general rule, investors from countries with different currencies are likely to disagree about an asset's expected return and risk. In theory, this means that the standard CAPM no longer holds, and a more complex, international CAPM is required. In practice, however, we find that the CAPM-based approach as laid out in Chapter 13 is still valid to estimate the cost of capital for cross-border investments.

Global CAPM The disagreement between investors about the return and risk of international investments disappears if purchasing power parity (PPP) holds across all currencies. In that case, changes in exchange rates perfectly match differences in inflation between currencies:[2]

$$X_t = X_{t-1}\left(\frac{1+i_A}{1+i_B}\right)$$

where X_t = exchange rate of currency B expressed in units of currency A at time t

i_A, i_B = inflation rate for currency A, B

As a result, the expected return and risk in real terms for any asset will be the same for all investors, regardless of their domestic currency. In this

[2]Technically, this is so-called relative purchasing power parity, referring to changes in prices and exchange rates. Absolute purchasing power parity requires that prices be the same across currencies (see, for example, Brealey et al., *Principles of Corporate Finance*, chap. 27).

example, any appreciation of the U.S. dollar relative to the euro would make the nominal bond return for U.S. investors lower. But if PPP holds, the inflation rate in the United States would be lower by exactly the same amount, so the payoff in real terms for U.S. and German investors would be equal. In real terms, there is no currency risk for investors. They will all hold the same global market portfolio of risky assets and face the same real risk-free rate, as if there were only a single currency. The resulting so-called global CAPM is in fact the standard CAPM with a global market portfolio. It expresses the expected real return for an asset *j* as follows:

$$E(r_j) = r_f + \beta_{j,G}[E(r_G) - r_f]$$

where r_j = return for asset *j*

r_f = risk-free rate

$\beta_{j,G}$ = beta of asset *j* versus global market portfolio *G*

$\beta_{j,A}, \beta_{j,B} =$ r_G = return for global market portfolio *G*

Following the global CAPM, the cost of capital for domestic and foreign assets is determined in exactly the same way. What matters is their beta relative to the global market portfolio and the market risk premium of that same portfolio relative to the risk-free rate.

This also makes intuitive sense. Consider the consumer goods companies Procter & Gamble and Unilever. Both sell their household products around the world and have roughly the same geographic spread. The shares of both are traded in the United States and Europe. The primary difference is that Procter & Gamble is domiciled in the United States, and Unilever is domiciled in the United Kingdom and the Netherlands. With such similar business profiles and investor bases, it would be odd if the two companies had different costs of capital. In general, we find that the domicile of otherwise-comparable companies does not influence their valuation levels. For example, the valuation multiples of U.S. and European pharmaceutical companies are all in a very narrow range around 12 times enterprise value to EBITA, regardless of the company domicile.

Technically, the global CAPM holds only if PPP holds, which is the case—in the long run.[3] Although evidence on PPP has been mixed in the past, more recent academic research finds that on average, deviations from PPP between currencies are reduced to half their value within three to five years. In other words, exchange rates ultimately do adjust for differences in inflation between countries, although not immediately and perfectly.

[3]For an overview, see A. M. Taylor and M. P. Taylor, "The Purchasing Power Parity Debate," *Journal of Economic Perspectives* 18, no. 4 (Fall 2004): 135–158.

For investors and companies able to invest outside their home markets without restrictions, we recommend using the global CAPM to estimate the cost of capital for foreign and domestic investments. Effectively, this means applying the approach described in Chapter 13. Although the alternative, international CAPM (discussed next), may be theoretically superior, it is far more complex and does not lead to materially different results in practice.

International CAPM If PPP does not hold, real returns from foreign assets are no longer free from currency risk, because changes in exchange rates are not offset by differences in inflation. The greater the correlation between the return on a foreign asset and the relevant currency rate, the higher the risk for an investor. Take, for example, a Dutch company whose stock returns, measured in euros, tend to be higher when the euro appreciates against the U.S. dollar and vice versa (for instance, because the company imports components from the United States and sells end products in Europe). The stock's returns will be more risky for an American investor than for a European investor, because the exchange rate tends to amplify the returns when translated into U.S. dollars. The absence of PPP means that disparities between dollar and euro inflation will not offset this difference in returns when measured in real terms.

To hold foreign assets, rational investors will require some compensation in the form of a higher expected return for an asset, depending on its exposure to currency risk. As a result, what matters for an asset's expected return is no longer only the asset's beta versus the global market portfolio (as in case of the global CAPM). The international CAPM captures the additional return requirements by also including asset betas versus currency exchange rates. For example, in a world consisting of three countries, each with its own currency, the international CAPM would define the expected return on asset j in a given home currency as follows:[4]

$$E(r_j) = r_f + \beta_{j,G}[E(r_G) - r_f] + \beta_{j,A}\text{CRP}_A + \beta_{j,B}\text{CRP}_B \tag{23.1}$$

where r_j = return for asset j

r_f = risk-free rate

$\beta_{j,G}$ = beta of asset j versus global market portfolio G

$\beta_{j,A}$, $\beta_{j,B}$ = beta of asset j versus currency rate X_A, X_B

CRP_A, CRP_B = risk premium for currency A, B

[4]This is a simplified version of the Solnik-Sercu international CAPM; see, for example, P. Sercu, *International Finance* (Princeton, NJ: Princeton University Press, 2009), chap. 19 and S. Armitage, *The Cost of Capital* (Cambridge, UK: Cambridge University Press, 2005), chap. 11.

The currency risk premiums are defined as follows:

$$\text{CRP}_n = \frac{E\,(X_{n1}) - F_{n1}}{X_{n0}} \tag{23.2}$$

where X_{nt} = exchange rate of home currency expressed in units of currency n at time t where $n = A,B$

F_{nt} = forward rate for time t of home currency expressed in units of currency n

Although theoretically correct, the international CAPM is probably too cumbersome for practical use. For example, it is not clear how many of the world's currencies to include in estimating the cost of capital. Even taking only a handful of leading global currencies would mean that you must estimate as many currency risk premiums. And in addition to an asset's market beta, you would need to estimate its beta versus each of these currencies.

Another reason not to use the international CAPM is that empirical research has shown that the currency risk premiums are typically too small to matter when estimating a cost of capital.[5] Recent research has shown that differences are probably less than half a percentage point when comparing cost of capital estimates from a global and an international CAPM for large U.S. companies.[6] As we can see from equations 23.1 and 23.2, the international CAPM simplifies to the global CAPM when currency risk premiums are negligible, reinforcing our recommendation to use the global CAPM.[7]

Local CAPM Some practitioners and academic researchers propose estimating the cost of capital for an investment opportunity in a particular country by using a local CAPM. The investment's beta is then estimated versus the market portfolio of the country, and the market risk premium follows from the excess return of that same market portfolio over the local risk-free rate. The approach is theoretically correct if stocks are correlated to the global market portfolio only through the local market:[8]

$$\beta_{j,G} = \beta_{j,L} \times \beta_{L,G} \tag{23.3}$$

[5]Sercu, *International Finance*, chap. 19.

[6]See W. Dolde, C. Giaccotto, D. Mishra, and T. O'Brien, "Should Managers Estimate Cost of Equity Using a Two-Factor International CAPM?" *Managerial Finance* 38, no. 8 (2012): 708–728; and D. Mishra and T. O'Brien, "A Comparison of Cost of Equity Estimates of Local and Global CAPMs," *Financial Review* 36, no. 4 (2001): 27–48.

[7]In other words, PPP apparently holds sufficiently well for the global CAPM to lead to the same cost of capital as the international CAPM.

[8]See R. Stulz, "The Cost of Capital in Internationally Integrated Markets: The Case of Nestlé," *European Financial Management* 1, no. 1 (1995): 11–22.

where $\beta_{j,G}$ = beta of asset *j* versus global market portfolio *G*
$\beta_{j,L}$ = beta of asset *j* versus local market portfolio *L*
$\beta_{L,G}$ = beta of local market portfolio *L* versus global market portfolio *G*

This implies that any international risk factors influencing the returns of companies in a given country are fully captured by the local market portfolio of that country. You can then indirectly estimate any asset's global beta by multiplying its local beta with the global beta of the local market. If the local stock market is fully integrated and correctly priced in the global market, its expected return is:

$$E(r_L) = r_f + \beta_{L,G}[E(r_G) - r_f] \tag{23.4}$$

where r_L = expected return for local market portfolio *L*
r_f = risk-free rate
r_G = return for global market portfolio *G*

Combining equations 23.3 and 23.4 shows that the expected return for a stock *j* estimated via the local and global CAPM should be equal as well. Following the global CAPM, this return is given by:

$$E(r_j) = r_f + \beta_{j,G}[E(r_G) - r_f]$$

Substituting the asset's global beta by the indirect beta defined previously in equation 23.3 leads to:

$$E(r_j) = r_f + \beta_{j,L} \times \beta_{L,G}[E(r_G) - r_f]$$

This can be rearranged to show equivalence with the local CAPM as:

$$E(r_j) = r_f + \beta_{j,L}[E(r_L) - r_f]$$

Although the assumptions may not seem very realistic at face value, there is evidence that the local and global CAPM generate similar results. Empirical research finds that the cost of capital estimated for U.S. companies with a local CAPM is very close to the estimate based on a global CAPM.[9] For U.S. stocks, this may not be surprising, as the U.S. market portfolio is well diversified and highly correlated with the global market portfolio. But supporting evidence also comes from nine developed economies, including not only the United States but also the United Kingdom, Germany, France, and smaller economies such as the Netherlands and Switzerland. An analysis of beta estimates for

[9] R. Harris, F. Marston, D. Mishra, and T. O'Brien, "Ex-Ante Cost of Equity Estimates of S&P 500 Firms: The Choice between Domestic and Global CAPM," *Financial Management* 32, no. 3 (2003): 51–66.

companies versus a local and global market portfolio has shown that for these countries the betas are typically related, as indicated by equation 23.3.[10]

However, the local CAPM approach has some practical drawbacks when compared with the global CAPM. When applying the local CAPM for investments in different countries, you should estimate the local market risk premium and beta for each of these countries instead of only the global market risk premium when applying the global CAPM. Using a local CAPM also means you cannot make a straightforward estimate of a company's beta based on the average of the estimated betas for a sample of industry peers. Estimating an industry-average beta is recommended in Chapter 13 to reduce its standard error, but if the peers are in different countries, their local betas are not directly comparable.

Last, but not least, local risk premiums are typically less stable over time than their aggregate, the global risk premium. For example, Exhibit 23.3 compares the realized premiums on local stock market indexes with government bond returns for several countries and the world, from Dimson, Marsh, and Staunton's analysis of long-term average returns on equities, corporate bonds, and short-term government bonds.[11] The individual countries' risk premiums vary considerably, depending on the time period over which they are measured, while the global premium remains almost unchanged.

Note that the risk premium differences shown in Exhibit 23.3 do not mean that the price for risk varies across these countries. These differences are driven by several factors. First, levels of economic development and, therefore, profit growth have varied over the past century among the countries. Second, capital markets were less integrated in the past, so prices across countries may not have been equalized. The main reason, though, is that many of the stock market indexes used had different levels of diversification and beta. Therefore, their performance was skewed by different industry concentrations. In most European countries the key stock market indexes, which account for the majority of their stock markets' total capitalization, typically include only 25 to 40 companies, often from a limited range of industries. Indeed, research has shown that a large fraction of the variation in returns on European market indexes could be explained by their industry composition (see Exhibit 23.4).[12]

We recommend a local CAPM only for investors and companies facing restrictions to invest abroad. In that case, the local market portfolio is the right

[10]See C. Koedijk, C. Kool, P. Schotman, and M. van Dijk, "The Cost of Capital in International Financial Markets: Local or Global?" *Journal of International Money and Finance* 21, no. 6 (2002): 905–929.

[11]E. Dimson, P. Marsh, and M. Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns* (Princeton, NJ: Princeton University Press, 2002); and E. Dimson, P. Marsh, M. Staunton, and M. Mauboussin, *Credit Suisse Global Investment Returns Yearbook 2014* (London: Credit Suisse Research Institute, 2014).

[12]R. Roll, "Industrial Structure and the Comparative Behavior of International Stock Market Indexes," *Journal of Finance* 47, no. 1 (1992): 3–42.

EXHIBIT 23.3 **Comparing Risk Premiums across Countries and over Time**

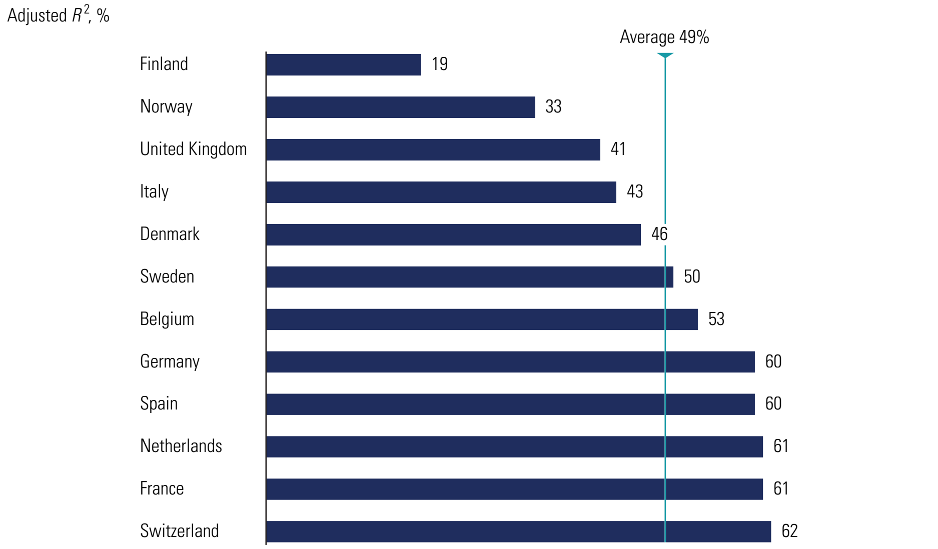
Annualized market risk premium over 1-year Treasury bills, %

Source: E. Dimson, P. Marsh, M. Staunton, and M. J. Mauboussin, *Credit Suisse Global Investment Returns Yearbook 2014* (London: Credit Suisse Research Institute, 2014).

reference to estimate the cost of capital. As a result, valuations in such restricted markets can be out of line with those in global markets—which is what we have encountered in the past for valuations in, for example, the Indian and mainland Chinese stock markets.

Estimating Market Risk Premium in Global CAPM In the absence of capital controls for investors, the global market risk premium should be based on a global index that includes most of the world's investment assets. As explained in Chapter 13, the market risk premium for an index can be estimated from its historical returns, from current financial ratios, or from forward-looking models, which, by and large, lead to similar results. Global indexes rarely go far back in time, so long-term estimates of historical market risk premiums are

EXHIBIT 23.4 **Share of Equity Returns Explained by Industry Composition of Index**



Source: R. Roll, "Industrial Structure and the Comparative Behaviour of International Stock Market Indexes," *Journal of Finance* 47, no. 1 (1992): 3–42.

not readily available. Therefore, we generally resort to specially compiled estimates for the global market or the well-diversified U.S. market as a basis for a global market risk premium. Correlation between the S&P 500 and global market indexes (such as the MSCI World Index) has, so far, been very high, making the S&P 500 a good proxy. Estimates from both sources are typically not far apart, falling in the range of 4.5 to 5.5 percent (also see Chapter 13).

Estimating Beta across Currencies in Global CAPM Since we are using a global market risk premium, a global beta should also be used. As just noted, the local market indexes of many countries are biased toward certain companies or industries. Therefore, a beta derived from a local market index does not necessarily represent the risk contribution of that stock to a diversified, global portfolio.

Follow the guidelines from Chapter 13 on how to estimate beta. There is one special issue to consider when estimating betas for stocks in international markets: the currency in which returns are measured. For example, should a Swiss investor estimate the beta of IBM based on returns in U.S. dollars or Swiss francs? If you use total returns to estimate beta, the results will be different when returns are expressed in U.S. dollars or Swiss francs, because the dollar-to-franc exchange rate fluctuates over time. But a stock's beta should be the same in all currencies, as any difference would imply differences in the real-terms cost of capital across currencies. The solution is to use excess returns over the risk-free rate, rather than total returns.[13] Beta estimates are consistent across currencies when the stock's excess returns are regressed against the excess return of a global market portfolio, as follows for any period ending at time t:

$$\left(r_{j,t}^{A} - r_{f,t}^{A}\right) = \beta_j \left(r_{M,t}^{A} - r_{f,t}^{A}\right)$$

where $r_{j,t}^{A}$ = realized return for stock j in currency A
$r_{f,t}^{A}$ = risk-free rate in currency A
$r_{M,t}^{A}$ = realized return for global market portfolio in currency A

If the international Fisher relation and purchasing power parity would hold, differences in international interest rates would reflect differences in inflation across countries; and differences in inflation across countries would also be reflected in changes in exchange rates. In that case, the risk-free rate for each currency should equal the U.S. dollar risk-free return and the change in the exchange rate:

$$\left(1 + r_{f,t}^{A}\right) = \left(1 + r_{f,t}^{\$}\right) \frac{X_{t-1}}{X_t} \tag{23.5}$$

where $r_{f,t}^{\$}$ = risk-free rate in U.S. dollars
X_t = exchange rate at time t of currency A expressed in U.S. dollars

If risk-free rates across currencies are tied to changes in exchange rates in this way, beta estimates based on excess returns will be the same whether we use U.S. dollars or Swiss francs (or any other currency, for that matter). In practice, the relations will not hold perfectly. To avoid any differences in beta estimates, we recommend using a synthetic risk-free rate for each currency when calculating a stock's excess returns, based on the U.S. risk-free rate and the U.S. dollar exchange rate as defined in equation 23.5.

Although many practitioners make ad hoc adjustments to the discount rate to reflect political risk, foreign-investment risk, or foreign-currency risk, we do not recommend this. As the discussion of emerging markets in Chapter 31 explains, political or country risk is best handled by adjusting expected cash flows and weighting them by the probability of various scenarios.

Finally, keep in mind that estimating a cost of capital is not a mechanical exercise with a precise outcome. The approach outlined in this chapter should

[13]Most practitioners use the so-called market model, estimating beta from absolute returns instead of excess returns. This is an approximation that produces good results if the risk-free rate is relatively stable. When translating returns from another currency, the approximation no longer holds, as the nominal risk-free rate will fluctuate with exchange rate.

be paired with sound judgment on long-term trends in interest rates and market risk premiums (see Chapter 13) to obtain a cost of capital estimate that is sufficiently robust for financial decision making.

INCORPORATING FOREIGN-CURRENCY RISK IN THE VALUATION

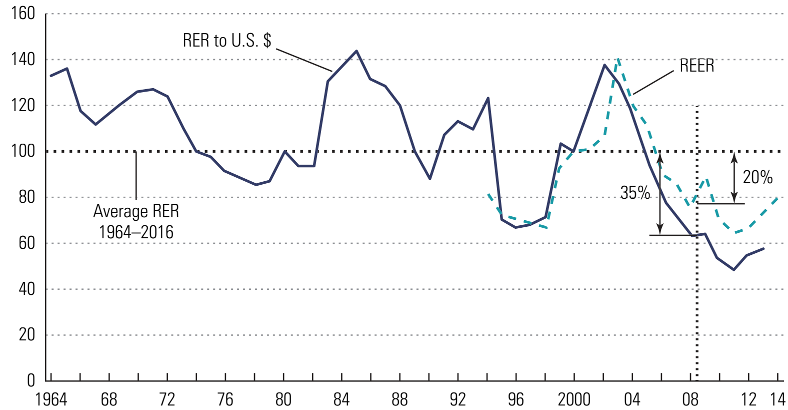
Many executives are concerned about currency fluctuations from foreign investments and their impact on value creation in company results. The analyst community and investors may be wary of the resulting earnings volatility (even though that does not matter for value creation). As a result, many companies still add a premium for currency risk to the cost of capital for foreign investments. There is no need for such a premium. As discussed in the previous section, currency risk premiums in the cost of capital—if any—are likely to be small. There should be no difference between the cost of capital for investments in foreign currency and otherwise identical investments in domestic currency. First of all, price fluctuations tend to mitigate currency fluctuations because of purchasing power parity. Second, currency risk is largely diversifiable for companies and shareholders. Any remaining risk from currency rate changes is best reflected in the cash flow projections for the investment.

Keep in mind that nominal currency risk is irrelevant if exchange rates immediately adjust to differences in inflation rates. The only relevant currency risk is therefore real currency risk as measured by changes in relative purchasing power. For example, if you held \$100 million of Brazilian currency in 1974, by 2014 it would have been practically worthless in U.S. dollars. Yet if you adjust for purchasing power, the value of the currency has fluctuated around the \$100 million mark during the 40-year period. Exhibit 23.5 shows the estimated real (inflation-adjusted) exchange rate for the Brazilian currency, which explains this effect.

To illustrate, suppose that instead of holding \$100 million of Brazilian currency, you held \$100 million of Brazil-based assets whose value increased with inflation since 1974. In most of those years, the value of those assets would have been within 20 percent of the original investment measured in U.S. dollars, as purchasing power parity kept the currency rate in line with inflation differences over the long term. Nevertheless, there would be significant deviations in other years. For example, at the end of 2013, the Brazilian assets would have been worth approximately \$175 million. To some extent, such deviations may be specific to the exchange rate with the U.S. dollar—which itself could be undervalued in terms of PPP with other currencies. For a more balanced view, the so-called real effective exchange rate (REER) reflects the purchasing power of the Brazilian currency versus an index of foreign currencies with more dampened deviations from PPP, at least for the past 20 years (see Exhibit 23.5). Analysis of purchasing power parity indicates that in general, currencies

EXHIBIT 23.5 **Brazilian Inflation-Adjusted Exchange Rates**

Real exchange rate (RER) index and real effective exchange rate (REER) index, 2000 = 100



Source: World Bank, MGM Consultants, Bank for International Settlements.

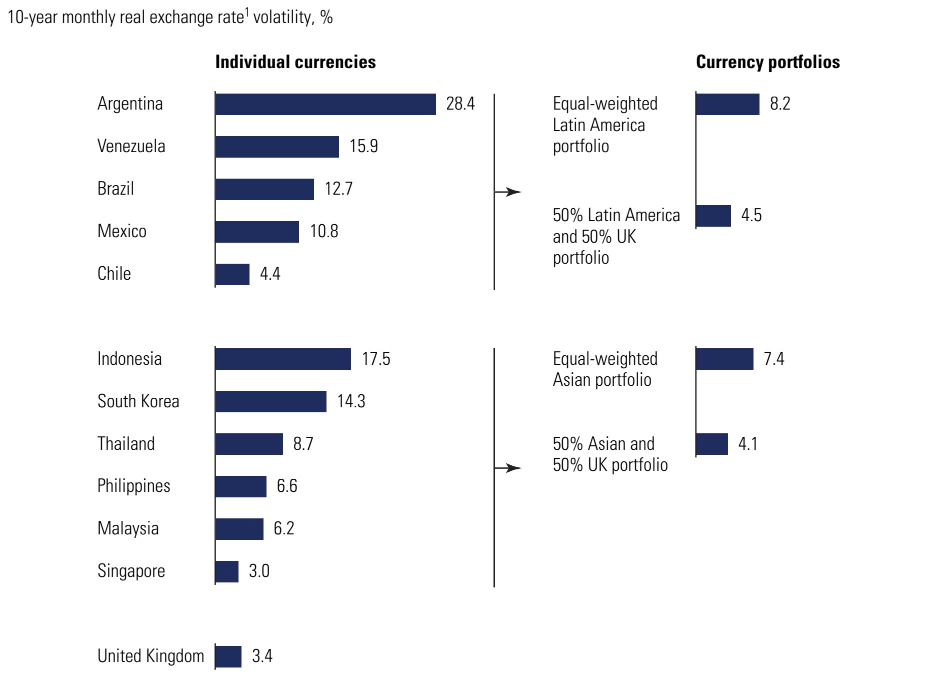
indeed revert to parity levels following changes in relative rates of inflation, but not immediately.[14]

Short-term deviations from exchange rates that give purchasing power parity potentially leave corporations exposed to real-terms currency risk. However, shareholders are typically able to diversify this risk. To see how, consider Exhibit 23.6, which shows the monthly volatility of real exchange rates for a selection of Latin American and Asian currencies, as well as the British pound, and compares them with four currency portfolios. Although some of the currencies are highly volatile, holding a regional portfolio already eliminates a lot of the resulting real currency risk, as shown by the lower volatility of the regional portfolios. Combining a developing-markets portfolio with a British-pounds portfolio diversifies the real risk even further. If shareholders can disperse most real currency risk by diversifying, there is no need for a currency risk premium of any significance in the company's cost of capital.

Sometimes currency exchange rates move fast and far from PPP. As Exhibit 23.5 showed, during a period of just two weeks in 1999, Brazil's currency weakened by more than 50 percent relative to the U.S. dollar. When conducting a valuation in a currency that shows large deviations from PPP, you should account for the risk of a few weeks or even several years passing before the currency moves back toward PPP. Do not adjust the cost of capital, but instead prepare cash flow projections for one or more currency scenarios as follows.

[14]See Taylor and Taylor, "The Purchasing Power Parity Debate."

EXHIBIT 23.6 **Diversification of Real Currency Risk**



[1] Exchange rates to U.S. dollar.
Source: International Monetary Fund.

If the foreign business being valued has limited international purchases and sales, its cash flows are largely determined by its local currency. The impact of any exchange rate convergence toward PPP is likely to be limited as well. In this case, value the business's forecast cash flows using either the spot-rate or forward-rate approach to obtain a valuation in your domestic currency. Apply two different currency scenarios: one using spot and forward rates based on the actual exchange rate, and one based on a deemed convergence of the exchange rate toward PPP. The valuation results in the local currency of the foreign business will be identical for both scenarios, but not so for the result in your domestic currency, highlighting the exposure to a potential exchange-rate change.

If the business has significant cash flows in international currencies, such as an exporting oil company, estimate the impact of an exchange-rate adjustment toward PPP on its cash flows in local currency. Prepare the local cash flow forecasts for the business based on two scenarios: one with convergence of the exchange rate toward PPP, and one without. Then value the cash flows for both currency scenarios using the spot-rate or forward-rate approach as outlined in the previous paragraph. Ensure that the spot and forward rates correctly reflect your assumptions on the convergence of the exchange rate. The result is again a valuation range in domestic currency, indicating the potential impact of an exchange-rate convergence to PPP.

USING TRANSLATED FOREIGN-CURRENCY FINANCIAL STATEMENTS

Analysis of the historical performance of foreign businesses is best conducted in the foreign currency. But sometimes this is not possible—for example, when the business's statements have been translated into its parent company's currency and included (or consolidated) in the parent's accounts. A British subsidiary of a European corporate group will always prepare financial statements in British pounds, and when the European parent company prepares its financial statements, it will translate the British pounds in the statements of the British subsidiary at the current euro–pound exchange rate.

However, if the exchange rate fluctuates from year to year, the European parent company will report the same asset at a different euro amount each year, even if the asset's value in British pounds has not changed. This change in the value of the British asset in the parent's reporting currency would suggest a cash expenditure. But no cash has been spent, because the change is solely due to a change in the exchange rate. Therefore, following the guidelines from Chapter 9, it's necessary to make a correction to the cash flow estimated from the financial statements that is equal to the gains or losses from the currency translation.

Between them, U.S. GAAP and IFRS sanction three approaches to translating the financial statements of foreign subsidiaries into the parent company's currency: the current method, the temporal method, and the inflation-adjusted current method. The correct approach to use depends on which standard you follow and the inflation rate in the country in question. Exhibit 23.7 shows the

EXHIBIT 23.7 **Currency Translation Approaches**

	U.S. GAAP	IFRS
Moderate inflation	Current method	Current method
Hyperinflation	Temporal method	Inflation-adjusted current method

approach recommended by each standard for countries with moderate inflation and for those with hyperinflation.

For subsidiaries in moderate-inflation countries, translating the financial statements into the currency of the parent company is fairly straightforward. Both U.S. GAAP and IFRS apply the current method, which requires translating all balance sheet items except equity at the year-end exchange rate. Translation gains and losses on the balance sheet are recognized in the equity account, so they do not affect net income. The average exchange rate for the period is used to translate the income statement.

For subsidiaries where inflation rates are higher, IFRS and U.S. GAAP differ in what they define as hyperinflation, whether to adjust statements for inflation, and what approach to use for translating the financial statements. U.S. GAAP defines hyperinflation as cumulative inflation over three years of approximately 100 percent or more. IFRS states that this is one indicator of hyperinflation but suggests considering other factors as well, such as the degree to which local investors prefer to keep wealth in nonmonetary assets or stable foreign currencies.

U.S. GAAP requires companies to use the temporal method for translating financial statements of subsidiaries in hyperinflation countries into the parent's currency. To use this method, you must translate all items in the financial statements at the exchange rate prevailing at the relevant transaction date. This means using historical exchange rates for items carried at historical cost, current exchange rates for monetary items, and year-average or other appropriate exchange rates for other balance sheet items and the income statement. Any resulting currency gains or losses are reported on the income statement of the parent.

The IFRS approach to currency translation for subsidiaries in hyperinflation countries is similar to that for moderate-inflation countries. The key difference is that IFRS requires the hyperinflation country statements to be restated in current (foreign) currency units based on a general price index before they are translated into the parent company's currency. All except some monetary items need to be restated to account for the estimated impact of very high inflation on values over time. This generally requires some judgment on the part of the translator and will also depend on the details of specific agreements and contracts; for example, any debt-financing agreements may or may not already be linked to an index. This restatement will result in a gain or loss on the subsidiary's income statement. Because the full statements are restated in current (year-end) foreign-currency units, the year-end exchange rate should be used to translate both the balance sheet and the income statement into the parent company's currency. Any translation gains or losses will be included in the equity account of the parent.

Exhibit 23.8 shows an example for a U.S. parent company using all three approaches to currency translation. In this example, the exchange rate has changed from 0.95 at the beginning of the year to 0.85 at the end of the year,

EXHIBIT 23.8 **Currency Translation**

		Current method		Temporal method		Inflation-adjusted current method		
	Local currency	Foreign-exchange rate	U.S. $	Foreign-exchange rate	U.S. $	Adjusted	Foreign-exchange rate	U.S. $
Balance sheet								
Cash and receivables	100	0.85	85	0.85	85	100	0.85	85
Inventory	300	0.85	255	0.90	270	321	0.85	273
Net fixed assets	600	0.85	510	0.95	570	684	0.85	581
	1,000	–	850	–	925	1,105	–	939
Current liabilities	265	0.85	225	0.85	225	265	0.85	225
Long-term debt	600	0.85	510	0.85	510	684	0.85	581
Equity								
Common stock	100	0.95	95	0.95	95	100	0.95	95
Retained earnings	35	–	32	–	95	56	–	48
Foreign-currency adjustment	–	–	(12)	–	–	–	–	(10)
	1,000	–	850	–	925	1,105	–	939
Income statement								
Revenue	150	0.90	135	0.90	135	161	0.85	137
Cost of goods sold	(70)	0.90	(63)	0.93	(65)	(75)	0.85	(64)
Depreciation	(20)	0.90	(18)	0.95	(19)	(23)	0.85	(20)
Other expenses, net	(10)	0.90	(9)	0.90	(9)	(11)	0.85	(9)
Foreign-exchange gain (loss)	–	–	–	–	66	20[1]	0.85	17
Income before taxes	50	–	45	–	108	72	–	61
Income taxes	(15)	0.90	(13)	0.90	(13)	(16)	0.85	(13)
Net income	35	–	32	–	95	56	–	48

[1] Gain from restatement.

consistent with 14 percent inflation in the foreign country during the year and U.S. inflation of 2 percent. The average exchange rate for the year is 0.90. As the exhibit illustrates, the three approaches can result in significantly different amounts for net income and equity in the parent company's currency. Of course, these differences should not affect your estimate of free cash flow for the subsidiary.

SUMMARY

You should apply the DCF valuation approach to foreign companies in just the same way you apply it to domestic companies. Nevertheless, some difficult issues can arise in valuing foreign companies or domestic companies with foreign operations. You need to understand and reflect local accounting in your analysis, but the adjustments are typically straightforward, following the general guidelines from Chapter 9. Because IFRS and U.S. GAAP are now the dominant accounting standards, however, any difficulties arising from international accounting differences have been greatly reduced.

Cash flows for foreign businesses can be projected in foreign or domestic currency as long as you apply your chosen method of currency translation—spot rate or forward rate—consistently. The approach for estimating the cost of capital should be the same for any company anywhere in the world. With the global integration of capital markets in mind, we recommend using a single real-terms, risk-free rate and market risk premium for companies around the world. Currency risks do not require separate premiums to be added to the cost of capital, as empirical research has shown that even though these are valid in theory, they have proven negligible in practice.

24

Case Study: Heineken*

This chapter applies the tools and techniques from Part Two and the previous chapters in Part Three. We present a case study that develops an external perspective on the performance and valuation of Heineken as of January 2014.[1]

Based in the Netherlands, the Heineken Group is the world's third-largest beer company, behind Anheuser-Busch InBev (AB InBev) and SABMiller. Its main brands are the popular Heineken and Amstel beers. The company is an international brewer; less than 5 percent of its volume comes from the Netherlands. Heineken earns 35 percent of net revenues in Western Europe, 16 percent in Central and Eastern Europe, 14 percent in Africa and the Middle East, 25 percent in the Americas, and 11 percent in the Asia-Pacific region. In recent years, Heineken acquired several beer companies, including British competitor Scottish & Newcastle (2007), the beer business of Mexico-based FEMSA (2010), and Asia Pacific Breweries (APB) of Singapore (2012). In 2013, after these acquisitions, Heineken generated revenues of €19 billion and employed more than 80,000 people worldwide.

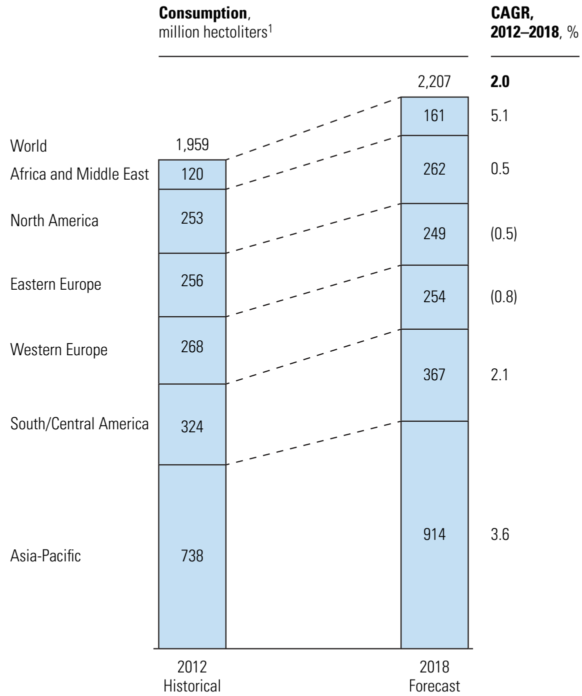
Heineken operates in an industry that has long been fragmented and regional and that has experienced slow to average growth. Over the five years leading to 2013, the volume of worldwide beer consumption grew 2 percent annually. Growth expectations for the period from 2012 to 2018 are also at around 2 percent per year, with low or negative growth in developed markets. Emerging markets provide the main source of growth (see Exhibit 24.1).

In the past decade, the beer industry has experienced some large mergers and acquisitions, making it somewhat less fragmented than before. The top three brewers have a combined market share of 36 percent worldwide (up from 30 percent in 2008 and 23 percent in 2003), and the top 20 brewers have a

*The authors would like to thank Stefan Roos and Abhishek Saxena for their contributions to this chapter.

[1] Because this is an illustration, we analyzed and adjusted some items that are immaterial for the valuation of Heineken but could be significant for the valuation of other companies.

EXHIBIT 24.1 **Worldwide Beer Growth**



[1] 1 hectoliter = 100 liters

Source: Canadean 2013 Global Beer Report.

combined market share of 72 percent. Although the global market is still fairly fragmented, many regional markets are oligopolies. For example, in each of the top 20 markets by size, the top two players have an average combined market share of 75 percent in 2012. However, the leading players vary from country to country (see Exhibit 24.2).

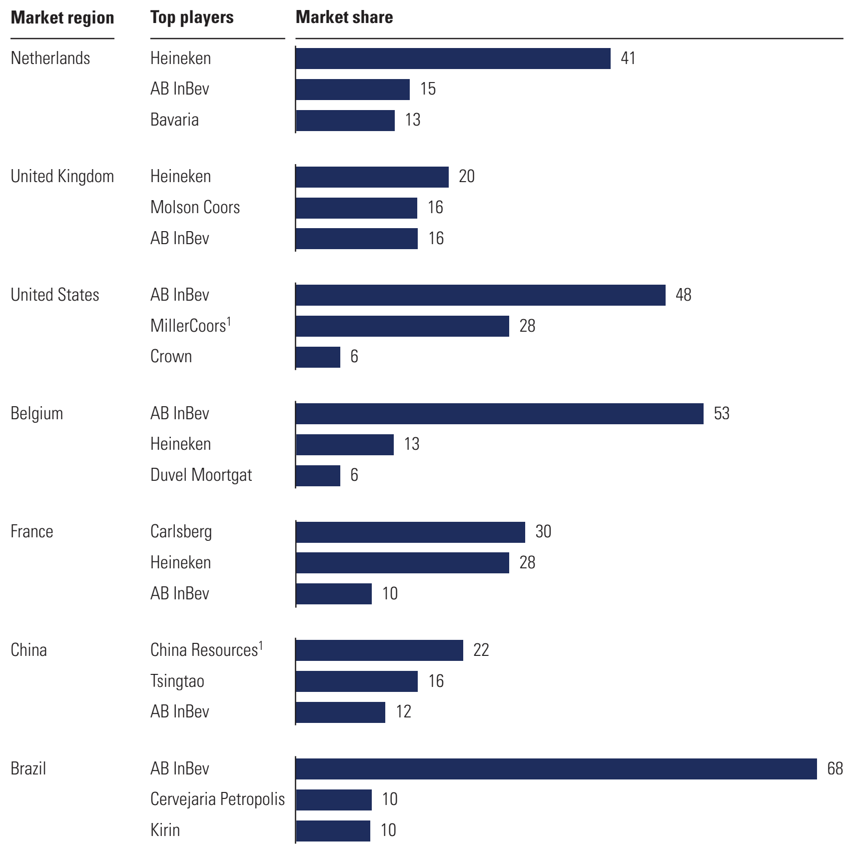
In the following sections, we rearrange Heineken's financial statements according to the methodology derived in Chapter 9. Then we analyze Heineken's historical profitability and growth rates, following the method described in Chapter 10. Next, we derive scenarios for Heineken's future performance and growth and corresponding cash flow projections. We estimate Heineken's cost of capital to derive the continuing value (CV) and discounted cash flow (DCF) of operations for each scenario. Finally, we estimate Heineken's value per share, following the approach set out in Chapter 14.

REORGANIZING FINANCIAL STATEMENTS

As explained in Chapter 9, to analyze Heineken's historical performance, it is necessary to reorganize the balance sheet and income statement to

EXHIBIT 24.2 **Beer Industry: National Market Share, 2012**

% of total volume in hectoliters



[1] Joint venture with SABMiller

Source: Canadean 2013 Global Beer Report, Euromonitor

separate the operating items from the nonoperating and financing items. Exhibits 24.3 through 24.12 detail the reorganization of Heineken's financials. Exhibits 24.3 and 24.4 present Heineken's income statements and balance sheets for the years 2009 through 2013, keeping as close as possible to the line item naming and structure of the company's 2013 annual report. Exhibits 24.5 through 24.12 present the calculations of Heineken's net operating profit less adjusted taxes (NOPLAT), invested capital, and free cash flow (FCF) for each year plus backup calculations and information on specific issues, such as pensions, goodwill, and deferred taxes.

In our analysis and reorganization of Heineken's financial statements, some accounting issues merit special attention. We detail them in the rest of this section.

EXHIBIT 24.3 **Heineken: Historical Income Statements**

€ million

	2009 restated	2010 reported	2011 reported	2012 reported	2013 reported
Revenues	14,701	16,133	17,123	18,383	19,203
Other income	41	239	64	1,510	226
Raw materials, consumables, and services	(9,650)	(10,291)	(10,966)	(11,849)	(12,186)
Personnel expenses	(2,379)	(2,680)	(2,838)	(3,037)	(3,108)
EBITDA	2,713	3,401	3,383	5,007	4,135
Depreciation[1]	(768)	(893)	(936)	(1,017)	(1,073)
Amortization of operating intangibles[1]	(30)	(34)	(36)	(47)	(37)
Amortization of acquired intangibles[1]	(97)	(158)	(193)	(200)	(339)
Impairment of goodwill, acquired intangibles[1]	(25)	(16)	(1)	(7)	(99)
Impairments of PP&E, operating intangibles[1]	(163)	(17)	(2)	(45)	(33)
Results from operating activities	1,630	2,283	2,215	3,691	2,554
Interest income	90	100	70	62	47
Interest expense	(633)	(590)	(494)	(551)	(579)
Other net finance income (expenses)	214	(19)	(6)	219	(61)
Profit before income tax	1,301	1,774	1,785	3,421	1,961
Income tax expenses	(286)	(399)	(465)	(525)	(520)
Share of profit of associates and joint ventures[2]	127	193	240	213	146
Income to noncontrolling interests	(124)	(132)	(130)	(160)	(223)
Net profit	1,018	1,436	1,430	2,949	1,364
Shareholders' equity					
Position as of January 1	4,471	5,351	9,932	9,774	11,734
Net profit	1,018	1,436	1,430	2,949	1,364
Other net recognized income and expense	154	447	(546)	(341)	(1,028)
Dividends	(289)	(351)	(474)	(494)	(530)
Share repurchases, net of shares issued[3]	(13)	3,330	(579)	(212)	(146)
Share-based payments	10	15	11	15	8
Position as of December 31	5,351	10,228	9,774	11,691	11,402

[1] Depreciation, amortization, impairments separated according to the information in the footnotes.
[2] In Heineken's annual report, this item is presented above the "profit before income tax" line.
[3] Purchase of own/noncontrolling shares, net of shares issued.

Income Statement and NOPLAT

First we deal with issues of interpretation arising from analysis of the income statement (Exhibit 24.3) to calculate NOPLAT (Exhibit 24.5).

Depreciation, amortization, and impairments To calculate NOPLAT, we separate the depreciation of property, plant, and equipment (PP&E) from amortization and impairments, which Heineken reports as a single item on the income statement. Within amortization, we further separate amortization of acquired intangibles (which is nonoperating, as discussed in Chapter 9) from operating amortization, which relates mostly to software.

EXHIBIT 24.4 **Heineken: Historical Balance Sheets**

€ million

	2009 restated	2010 reported	2011 reported	2012 reported	2013 reported
Inventories	1,010	1,206	1,352	1,596	1,512
Trade and other receivables	2,310	2,273	2,260	2,537	2,427
Prepayments and accrued income	189	206	170	232	218
Cash and cash equivalents	520	610	813	1,037	1,290
Other investments	15	17	14	11	11
Assets classified as held for sale	109	6	99	124	37
Total current assets	4,153	4,318	4,708	5,537	5,495
Property, plant, and equipment	6,017	7,687	7,860	8,792	8,454
Intangible assets	7,135	10,890	10,835	17,725	15,934
Investments in associates and joint ventures	1,427	1,673	1,764	1,950	1,883
Other investments	568	1,103	1,129	1,099	762
Advances to customers	319	449	357	312	301
Deferred-tax assets	561	429	474	564	508
Total noncurrent assets	16,027	22,231	22,419	30,442	27,842
Total assets	20,180	26,549	27,127	35,979	33,337
Bank overdrafts	156	132	207	191	178
Loans and borrowings	1,145	862	981	1,863	2,195
Trade and other payables	3,696	4,265	4,624	5,273	5,131
Tax liabilities	132	241	207	305	317
Provisions	162	123	140	129	171
Liabilities classified as held for sale	65	–	–	39	11
Total current liabilities	5,356	5,623	6,159	7,800	8,003
Loans and borrowings	7,401	8,078	8,199	11,437	9,853
Employee benefits	634	687	1,174	1,632	1,202
Tax liabilities	–	178	160	140	112
Provisions	356	475	449	418	367
Deferred-tax liabilities	786	991	894	1,790	1,444
Total noncurrent liabilities	9,177	10,409	10,876	15,417	12,978
Equity attributable to equity holders of the company	5,351	10,228	9,774	11,691	11,402
Equity attributable to noncontrolling interests	296	289	318	1,071	954
Total equity	5,647	10,517	10,092	12,762	12,356
Total liabilities and shareholders' equity	20,180	26,549	27,127	35,979	33,337

Other income According to notes to Heineken's financial statements, the item "Other income" mainly relates to gains on the sale of fixed assets. Therefore, in the NOPLAT statement, we exclude it from operating earnings and classify it as a nonoperating gain (or loss) on the sale of fixed assets. Especially for 2012, the impact of this adjustment is significant, eliminating €1,510 million from reported earnings before interest and taxes (EBIT).

EXHIBIT 24.5 **Heineken: NOPLAT Calculation**

€ million

	2009 restated	2010 reported	2011 reported	2012 reported	2013 reported
Revenues	14,701	16,133	17,123	18,383	19,203
Raw materials, consumables, and services	(9,650)	(10,291)	(10,966)	(11,849)	(12,186)
Personnel expense, as reported	(2,379)	(2,680)	(2,838)	(3,037)	(3,108)
Remove: Reported pension expense	107	104	56	28	41
Add: Current service cost and administration expense	(70)	(77)	(71)	(63)	(83)
Remove: Restructuring expenses	99	119	81	97	99
Remove: Additions to other nonoperating provisions	49	121	(3)	14	25
Remove: Other exceptional expenses	–	–	–	50	–
Personnel expenses, adjusted	(2,194)	(2,413)	(2,775)	(2,911)	(3,026)
Operating EBITDA	2,857	3,429	3,382	3,623	3,991
Depreciation, as reported	(768)	(893)	(936)	(1,017)	(1,073)
Amortization of operating intangibles	(30)	(34)	(36)	(47)	(37)
Operating EBITA	2,059	2,502	2,410	2,559	2,881
Operating cash taxes	(549)	(720)	(639)	(669)	(835)
NOPLAT	1,510	1,782	1,771	1,890	2,046
Operating cash taxes					
Statutory domestic tax rate, %	25.5	25.5	25.0	25.0	25.0
Income tax at statutory domestic rate	525	638	603	640	720
Tax effect of foreign operations	21	34	62	62	80
Income tax at blended global rate	546	672	665	701	801
(Increase) decrease in operating deferred-tax liability	3	48	(26)	(32)	34
Operating cash taxes	549	720	639	669	835
Operating cash tax rate, %	26.7	28.8	26.5	26.2	29.0
Reconciliation with net profit					
Net profit	1,018	1,436	1,430	2,949	1,364
Income to noncontrolling interests	124	132	130	160	223
Nonoperating taxes	(260)	(273)	(200)	(176)	(281)
(Increase) decrease in operating deferred-tax liability	(3)	(48)	26	32	(34)
Interest expense	633	590	494	551	579
Interest income	(90)	(100)	(70)	(62)	(47)
Other net finance income (expenses)	(214)	19	6	(219)	61
Income from nonconsolidated investments	(127)	(193)	(240)	(213)	(146)
Gain (loss) on sale of fixed assets	(41)	(239)	(64)	(1,510)	(226)
Amortization of acquired intangibles	97	158	193	200	339
Impairment of goodwill, acquired intangibles	25	16	1	7	99
Impairments of PP&E, operating intangibles	163	17	2	45	33
Restructuring expenses	99	119	81	97	99
Additions to other nonoperating provisions[1]	49	121	(3)	14	25
Other exceptional expenses	–	–	–	50	–
Net pension adjustments	37	27	(15)	(35)	(42)
NOPLAT	1,510	1,782	1,771	1,890	2,046

[1] Net of reversals.

EXHIBIT 24.6 **Heineken: Pension Expense Recognized in Income Statement**

€ million

	2012	2012 restated	2013
Current service costs	63	60	80
Administration expense	–	3	3
Operating pension costs	63	63	83
Interest expense	330		
Expected return on defined-benefit plan assets	(322)		
Past service cost (credit)[1]	(43)	(43)	(42)
Nonoperating pension costs	(35)	(43)	(42)
Total pension costs in personnel expenses	28	20	41
Interest on net defined-benefit obligation		51	56
Total pension costs in income statement	28	71	97

[1] Includes €41 million curtailment or settlement in 2012.

Personnel expenses We take out the entire reported pension expense and recognize only the current service and administrative costs under personnel expenses. Exhibit 24.6 shows that until 2012, the total pension expense includes several nonoperating items, such as interest on the pension obligation, expected return on plan assets, and past service costs. After the adoption of International Accounting Standard (IAS) 19 in the restated 2012 and the 2013 financials, the interest and expected-return items are not included in personnel expenses, and interest on the net pension obligation is included under financial income.

Restructuring and exceptional charges In Heineken's annual report, note 27, headed "Non-GAAP Measures" or "EBIT and EBIT (beia)," provides information on what the company considers nonoperating items in reported EBIT. For the amortization and impairments of acquisition-related intangibles and gains on disposals of assets, the exclusion from Heineken's operating profit is largely consistent with our adjustments to EBIT (see Exhibit 24.7).[2] Other nonoperating items that we derive from the same note are:

- *Restructuring expenses.* Starting in 2009, we removed from operating earnings before interest, taxes, and amortization (EBITA) all expenses Heineken reported for restructuring, redundancies, and contract settlements.

[2] Our estimates of these items differ somewhat from the amounts indicated by Heineken: we assume all intangibles other than software are acquisition related (the resulting amortization difference is €40 million in 2013), and we exclude gains or losses on all asset sales (the resulting difference is €87 million in 2013).

EXHIBIT 24.7 **Heineken: Adjustments for Operating EBITA Calculation**

€ million

	2009	2010	2011	2012	2013
Results from operating activities, as reported on the consolidated income statement	1,630	2,283	2,215	3,691	2,554
Remove: Amortization of acquisition-related intangibles and impairments	285	191	196	252	471
Remove: Nonoperating pension cost (credit)	37	27	(15)	(35)	(42)
Remove: Additions to nonoperating provisions	49	121	(3)	14	25
Remove: Restructuring expenses	99	119	81	97	99
Remove: Other exceptional acquisition-related expenses	–	–	–	50	–
Remove: Gain on disposals	(41)	(239)	(64)	(1,510)	(226)
Operating EBITA	2,059	2,502	2,410	2,559	2,881
Itemization: Restructuring expenses					
TCM-related restructuring expenses[1]	99	–	–	–	–
FEMSA acquisition and integration expense	–	80	–	–	–
TCM expenses and one-off expenses due to contract terminations	–	39	–	–	–
TCM-related costs for redundancies and contract settlements	–	–	81	–	–
Restructuring activities in wholesale in Western Europe	–	–	–	97	–
Restructuring expenses in Europe	–	–	–	–	99
Total	**99**	**119**	**81**	**97**	**99**
Itemization: Other exceptional expenses					
Acquisition-related costs	–	–	–	28	–
Adjustments to an acquisition	–	–	–	20	–
Other exceptional items	–	–	–	2	–
Total	**–**	**–**	**–**	**50**	**–**

[1] TCM stands for Total Cost Management program, initiated by Heineken in 2009.

- *Acquisition-related expenses.* For 2012, we excluded from operating EBITA €50 million of exceptional charges indicated by Heineken, mainly for acquisition-related costs and adjustments.

In addition, we exclude additions to other nonoperating provisions (net of reversals). Apart from restructuring provisions, Heineken has other nonoperating provisions, mainly for onerous contracts, litigation claims, and environmental liabilities. We assume that net additions to these provisions were included as charges to EBIT and should be reversed when calculating operating EBITA (for 2013, €25 million).

We assume that most of the restructuring and other nonoperating items are labor related. Therefore, the way we handle all the items just listed is to exclude them from personnel expenses in NOPLAT and include them as nonoperating results in the reconciliation to net profit.

Operating cash taxes To find operating cash taxes, we use the simple method explained in Chapter 18, assuming that nonoperating items are taxed domestically. Exhibit 24.5 shows how cash operating taxes equal the sum of income taxes at the blended global rate plus the change in the operating deferred taxes.

EXHIBIT 24.8 **Treatment of Deferred-Tax Assets (DTAs) and Liabilities (DTLs)**

€ million

Net deferred-tax assets as reported	2012 restated	2013	Treatment in invested capital[1]	Change in net deferred tax assets 2013	Treatment in free cash flow	2013
Operating[2]					NOPLAT[2]	34
Property, plant, and equipment	(620)	(536)			Change in operating DTAs/DTLs[3]	56
Inventories	13	19	Operating DTAs/DTLs (EE)	90		90
Total	(607)	(517)				
Nonoperating						
Investments	122	119				
Loans and borrowings	2	1				
Employee benefits	383	315	Nonoperating DTAs/DTLs (EE)	(67)	Change in nonoperating DTAs/DTLs	(67)
Provisions	108	101				
Other items	47	59				
Total	662	595				
Intangible assets	(1,535)	(1,234)	Intangibles adjustment (NOA)[4]	301	Investment in goodwill and intangibles	301
Tax loss carryforwards	238	220	Tax loss carryforwards (NOA)	(18)	Change in tax loss carryforwards	(18)
Total net assets (liabilities)	(1,242)	(936)		306		306
Recognized as assets	550	508				
Recognized as liabilities	1,792	1,444				
Total net assets (liabilities)	(1,242)	(936)				

[1] EE is equity equivalent; NOA is nonoperating asset.
[2] Items booked through the profit and loss statement (P&L) and recurring items (e.g., origination, reversal of depreciation differences in PP&E and inventory, etc.).
[3] Items not booked through P&L and/or not recurring (e.g., changes in future tax rates).
[4] Netted out against grossed-up intangibles.

Income taxes at the blended global rate are simply earnings before interest, taxes, and amortization (EBITA) times the domestic tax rate net of any tax effects of foreign operations.

We estimate the change in the operating deferred taxes by using additional information from the notes to Heineken's financial statements, which detail the components of the deferred-tax assets and liabilities in the balance sheet (see Exhibit 24.8):

- *Operating deferred taxes* are assumed to be those related to PP&E, inventory, and operating intangibles. They are treated as equity equivalents in invested-capital calculations (see Exhibit 24.8). Annual changes in operating deferred taxes are included in NOPLAT as part of operating cash taxes if the changes were (1) recurring and (2) charged or credited to the income statement. Examples are changes in deferred taxes driven by depreciation differences in net PP&E. But many changes in Heineken's operating deferred taxes are nonrecurring (for example, changes as a result of tax rate revisions and under-/overprovisions in prior years) or did not pass through the income statement (e.g., changes as a result of acquisitions). For 2013, only €34 million in operating deferred-tax changes are included in NOPLAT.

- *Deferred-tax items for nonoperating assets or liabilities* such as investments, loans and borrowings, employee benefits, and provisions are treated as equity equivalents in the invested-capital calculation and do not affect NOPLAT.[3]
- *Deferred taxes for intangibles* are netted out in the invested-capital statement as an adjustment to acquired intangibles (listed in Exhibit 24.9 as a €1,234 million reversal of intangibles value adjustment in 2013). We assume this tax position results from the nondeductible amortization of a step-up of acquired intangibles, which is purely an accounting convention, as shown in Chapter 18, and does not affect NOPLAT.
- *Tax loss carryforwards* are unrelated to any other balance sheet item and are treated as a separate nonoperating asset in invested-capital calculations (€220 million in 2013). They do not affect NOPLAT.

To reconcile the operating taxes to reported taxes, we use the item called "nonoperating taxes" in the reconciliation with net profit on the NOPLAT statement.

Balance Sheet and Invested Capital

Next we show how any financial and other nonoperating assets shown on the balance sheet (Exhibit 24.4) are excluded from the calculation of invested capital (Exhibit 24.9).

Trade and other receivables On the balance sheet, Heineken includes several nonoperating items in trade and other receivables. We exclude from invested capital derivatives used for hedging from trade receivables, and group these under other financial assets (€45 million in 2013). Heineken reports gains or losses on these derivatives under net finance expenses in the income statement or as changes in hedging reserves in shareholders' equity.

Other investments and assets held for sale Other investments (€762 million current plus (€11 million noncurrent assets in 2013) and net assets held for sale

[3] Alternatively, you can group these deferred-tax items with the underlying assets or liabilities, as we did in Chapter 9 for retirement-related liabilities to more accurately estimate the associated cash flows. Note that this does not have an impact on free cash flow and DCF valuation results as these assets and liabilities are nonoperating.

EXHIBIT 24.9 **Heineken: Calculation of Invested Capital**

€ million

	2009 restated	2010 reported	2011 reported	2012 reported	2013 reported
Working cash	294	323	342	368	384
Trade receivables	2,261	2,263	2,223	2,500	2,382
Inventories	1,010	1,206	1,352	1,596	1,512
Prepayments and accrued income	189	206	170	232	218
Operating current assets	3,754	3,998	4,087	4,696	4,496
Trade payables	(1,361)	(1,660)	(2,009)	(2,244)	(2,140)
Accruals and deferred income	(891)	(909)	(920)	(1,163)	(1,047)
Other operating current liabilities	(1,324)	(1,625)	(1,605)	(1,867)	(1,888)
Operating current liabilities	(3,576)	(4,194)	(4,534)	(5,274)	(5,075)
Operating working capital	178	(196)	(447)	(578)	(579)
Net property, plant, and equipment	6,017	7,687	7,860	8,792	8,454
Operating intangibles	77	136	135	223	218
Other operating noncurrent assets	319	449	357	312	301
Invested capital without goodwill	6,591	8,076	7,905	8,749	8,394
Goodwill and acquired intangibles	7,058	10,754	10,700	17,502	15,716
Cumulative amortization and unrecorded goodwill	3,524	3,633	3,711	3,874	4,116
Reversal of intangibles value adjustment	(269)	(727)	(682)	(1,533)	(1,234)
Invested capital with goodwill	16,904	21,736	21,635	28,591	26,992
Excess cash	226	287	471	669	906
Nonconsolidated investments	1,427	1,673	1,764	1,950	1,883
Other financial assets	582	796	955	1,039	583
Tax loss carryforwards	137	213	237	238	220
Total funds invested	19,276	24,705	25,061	32,488	30,584
Shareholders' equity	5,351	10,228	9,774	11,691	11,402
Dividends payable	24	53	33	47	36
Operating deferred-tax liabilities, net of assets	319	437	486	607	517
Nonoperating deferred-tax liabilities, net of assets[1]	(226)	(389)	(511)	(676)	(595)
Cumulative amortization and unrecorded goodwill	3,524	3,633	3,711	3,874	4,116
Equity and equivalents	8,992	13,962	13,493	15,543	15,476
Short-term debt	1,301	994	1,188	2,054	2,373
Long-term debt	7,401	8,078	8,199	11,437	9,853
Interest payable	134	97	100	204	188
Postretirement benefit liabilities	634	687	1,174	1,632	1,202
Other nonoperating provisions	347	486	438	409	374
Restructuring provisions	171	112	151	138	164
Noncontrolling interests	296	289	318	1,071	954
Debt and equivalents	10,284	10,743	11,568	16,945	15,108
Total funds invested	19,276	24,705	25,061	32,488	30,584

[1] Excludes deferred-tax liabilities related to acquired intangible assets.

EXHIBIT 24.10 **Heineken: Adjustments to Goodwill and Acquired Intangible Assets**

€ million

	2009 restated	2010 reported	2011 reported	2012 reported	2013 reported
Goodwill and acquired intangibles	7,058	10,754	10,700	17,502	15,716
Accumulated goodwill directly written off against equity (pre-2003)	3,027	3,027	3,027	3,027	3,027
Accumulated goodwill amortized (2003–2004)	117	117	117	117	117
Accumulated goodwill impaired (2005–2013) plus accumulated amortization and impairments of acquired intangibles	380	489	567	730	972
Total adjusted goodwill and acquired intangibles	10,582	14,387	14,411	21,376	19,832

(€37 million in assets minus €11 million in liabilities in 2013) are nonoperating. In the invested-capital statement, they are included in other financial assets.

Trade and other payables From Heineken's reported trade and other payables (on the balance sheet given as €5,131million in 2013), we include trade payables (€2,140 million), accruals and deferred income (€1,047 million), and other operating current liabilities (€1,571 million) under operating current liabilities. The remaining items are reclassified as derivatives used for hedging (€149 million) under other financial assets, as dividends payable (€36 million), and as interest payable (€188 million).

Tax liabilities We have added the current tax liabilities (€317 million in 2013) under noncurrent/short-term to other operating current liabilities, which brings these to a total of €1,888 million in 2013. Since the acquisition of the FEMSA beer operations, Heineken also has recognized noncurrent tax liabilities that have been steadily decreasing, from €178 million in the 2010 balance sheet to €112 million in 2013. We treat these as nonoperating liabilities that are deducted from other financial assets.[4]

Intangible assets We split intangible assets as reported into operating intangibles and goodwill and acquired intangibles, so we can estimate return on invested capital (ROIC), including and excluding goodwill and acquired intangibles. For Heineken we consider the amounts reported under software, research and development, and other intangibles to be operating intangibles at €218 million in 2013. We assume that all remaining intangibles, such as brand and customer-related intangibles, were obtained through acquisitions. As explained in Chapter 8, we add back cumulative historical amortization and impairments to the amount of goodwill and acquired intangibles reported in the balance sheet, amounting to a total of around €20 billion in 2013 (see Exhibit 24.10). As previously discussed, we also deduct the intangibles value adjustment of €1,234 million in deferred-tax liabilities.

[4]Related to this liability, Heineken reports a gradually decreasing indemnification receivable of a similar amount, which we also include under other financial assets.

The goodwill amortization and impairment adjustment for Heineken is complex because of two changes in accounting treatment. Until 2002, Heineken used to write off any amount of goodwill directly against equity. The total cumulative amount written off until 2002 is not reported, but we made an estimate by adding up all the annual goodwill write-offs (net of reversals) since 1980. These amount to around €3 billion. After 2002, Heineken switched to amortization of goodwill and charged a total of €117 million in amortization to the income statement in 2003 and 2004. After 2004 and the introduction of International Financial Reporting Standards (IFRS), Heineken stopped amortizing goodwill. Since 2004, the total amount of goodwill impaired plus acquired intangibles, amortized or impaired, comes to €972 million as of 2013. As a result, total cumulative amortization and impairments of €4,116 million should be added to reported goodwill and acquired intangibles of €15,716 million in 2013.

Customer advances Advances to customers are up-front payments of revenue discounts that are amortized and deducted from revenues in later years. As no interest is received on the advance payments, we classify these as operating noncurrent assets (€301 million in 2013).

Other financial assets Under other financial assets, we include current and noncurrent other investments (€11 million and €762 million in 2013, respectively), net assets held for sale (€37 million in assets net of €11 million in liabilities), derivatives used for hedging (€45 million in assets net of €149 million in liabilities), and long-term tax liabilities (€112 million). All these items are considered nonoperating assets and liabilities.

Provisions We assume all of Heineken's current and noncurrent provisions are nonoperating, according to the methodology explained in Chapter 19, since these mainly concern restructuring, litigation, and environmental costs. We separate restructuring provisions from other nonoperating provisions within total funds invested because restructuring expenses are separately adjusted for in NOPLAT (see the preceding discussion under "Restructuring and Exceptional Charges"). Note that all retirement-related provisions are separately reported in the balance sheet.

Free-Cash-Flow Statement

To calculate free cash flow, we add back depreciation and amortization costs to NOPLAT and deduct investments in invested capital (see Exhibit 24.11).

Financial restatements Heineken restated its reported financials because of changes in reporting for employee benefits (2010 and 2012 restatements) and in accounting for acquired Asia Pacific Breweries assets (2012 restatement). The

EXHIBIT 24.11 **Heineken: Calculation of Free Cash Flow**[1]

€ million

	2010	2011	2012	2013
NOPLAT	1,782	1,771	1,890	2,046
Depreciation and amortization of operating intangibles	927	972	1,064	1,110
Gross cash flow	2,709	2,743	2,954	3,156
Investment in operating working capital	374	250	132	(11)
Investment in PP&E, operating intangibles	(2,656)	(1,144)	(2,084)	(715)
Investments in other noncurrent operating assets	(130)	92	45	11
Impairments of PP&E, operating intangibles	(17)	(2)	(45)	(33)
Effect of exchange rate changes and hyperinflation on PP&E	125	(159)	65	(352)
Gross investment	(2,304)	(963)	(1,887)	(1,100)
Free cash flow before goodwill	406	1,780	1,066	2,056
Investments in goodwill and acquired intangibles	(3,367)	(134)	(6,106)	1,108
Effect of exchange rate changes on goodwill and acquired intangibles	150	(217)	(28)	(986)
Free cash flow after goodwill	(2,811)	1,429	(5,067)	2,178
Restructuring expenses	(119)	(81)	(97)	(99)
Increase (decrease) in restructuring provisions	(59)	39	(13)	26
Additions to other nonoperating provisions, net of reversals	(121)	3	(14)	(25)
Increase (decrease) in other nonoperating provisions	139	(48)	(29)	(36)
Other exceptional expenses	–	–	(50)	–
Gain (loss) on disposals	239	64	1,510	226
Interest income	100	70	62	47
Income from nonconsolidated investments	193	240	213	146
Other net finance income (expenses)	(19)	(6)	219	(61)
Net investment in nonconsolidated investments	(246)	(91)	(186)	67
Net investment in other financial assets	(214)	(159)	(84)	456
Decrease (increase) in excess cash	(61)	(183)	(199)	(237)
Change in currency translation reserve[2]	125	(117)	8	57
Other comprehensive income (excluding translation effects)[3]	89	(64)	(389)	166
Taxes on nonoperating items[4]	227	149	124	182
Decrease (increase) in tax loss carryforwards	(76)	(24)	(1)	18
Increase (decrease) in operating deferred tax liabilities, net of assets[5]	166	23	89	(56)
Increase (decrease) in nonoperating deferred tax liabilities, net of assets[6]	(163)	(9)	(165)	67
Nonoperating cash flow	200	(194)	998	945
Cash flow available to investors	(2,611)	1,235	(4,069)	3,123
Increase (decrease) in postretirement benefit liabilities, net of assets	(26)	(92)	(493)	331
Interest expense	590	494	551	579
Decrease (increase) in short-term debt	344	(197)	(970)	(303)
Decrease (increase) in long-term debt	(677)	(121)	(3,238)	1,584
Flow to (from) debt holders	231	84	(4,150)	2,191
Dividends to noncontrolling interest holders	138	97	110	185
Other decrease (increase) in noncontrolling interests	43	(8)	(706)	68
Dividends to shareholders	351	474	494	530
Decrease (increase) in dividends payable	(29)	20	(14)	11
Net share repurchases and share-based payments	(3,345)	568	197	138
Flow to (from) equity holders	(2,842)	1,151	81	932
Cash flow available to investors	(2,611)	1,235	(4,069)	3,123

[1] Changes in balance sheet items calculated based on prior-year restated balance sheet.
[2] Excludes changes related to PP&E, goodwill, and acquired intangibles.
[3] Net of pension adjustments to personnel expenses.
[4] Excludes tax adjustment for grossed-up acquired intangibles.
[5] Excludes changes in operating deferred-tax liabilities included in operating cash taxes.
[6] Excludes changes in deferred-tax liabilities related to acquired intangible assets.

EXHIBIT 24.12 **Heineken: Balance Sheet and Invested-Capital Items Affected by Restatements**

€ million

Balance sheet	2010 reported	2010 restated	2012 reported	2012 restated
Property, plant, and equipment			8,792	8,844
Intangible assets			17,725	17,688
Deferred-tax assets	429	542	564	550
Total assets restatement effect		113		1
Trade and other payables			5,273	5,285
Employee benefits	687	1,097	1,632	1,575
Provisions			418	419
Equity attributable to equity holders of the company	10,228	9,932	11,691	11,734
Total liabilities and shareholders' equity restatement effect		114		(1)
Invested capital				
Accruals and deferred income			1,163	1,162
Other operating current liabilities			(1,867)	(1,880)
Net property, plant, and equipment			8,792	8,844
Goodwill and acquired intangibles			17,502	17,465
Reversal of intangibles value adjustment			(1,533)	(1,535)
Total assets restatement effect				(1)
Shareholders' equity	10,228	9,932	11,691	11,734
Postretirement benefit liabilities, net of assets	687	1,097	1,632	1,575
Other nonoperating provisions			409	410
Nonoperating deferred-tax liabilities, net of assets	(389)	(502)	(676)	(662)
Total liabilities and shareholders' equity restatement effect		1		1

calculation of FCF for 2011 and 2013, which uses year-on-year changes in balance sheet items, is based on the restated 2010 and 2012 figures. We summarize the balance sheet restatements that materially affect the free cash flow calculations in Exhibit 24.12.

Impairments All impairments are added to the increases in PP&E and operating intangibles when calculating the corresponding investment cash flows.

Exchange rate and hyperinflation effects When calculating free cash flow, we eliminate any effect from hyperinflation and movements in exchange rates to estimate the actual cash spent on investments in PP&E, operating intangibles, and goodwill. In 2013, failure to do so would lead to overestimating Heineken's free cash flow by more than €1 billion. Details are found in the notes to the corresponding asset categories in the annual report.

EXHIBIT 24.13 **Heineken: Historical Operating Ratios**

%

Operating ratios	2009	2010	2011	2012	2013
Operating EBITA/revenues	14.0	15.5	14.1	13.9	15.0
Raw materials/revenues	65.6	63.8	64.0	64.5	63.5
Personnel expenses/revenues	14.9	15.0	16.2	15.8	15.8
Depreciation/revenues	5.4	5.7	5.7	5.8	5.8
Return on invested capital (average)					
Operating fixed assets/revenues[1]	42.4	45.5	48.5	48.1	47.8
Operating working capital/revenues	4.6	(0.1)	(1.9)	(2.8)	(3.0)
Revenues/invested capital, times	2.1	2.2	2.1	2.2	2.2
Pretax ROIC	29.8	34.1	30.2	30.7	33.5
Operating cash tax rate	26.7	28.8	26.5	26.2	29.0
After-tax ROIC	21.8	24.3	22.2	22.7	23.8
After-tax ROIC including goodwill	8.8	9.2	8.2	7.5	7.4
Growth rates					
Revenue growth rate	2.7	9.7	6.1	7.4	4.5
Operating EBITA growth rate	15.4	21.5	(3.7)	6.2	12.7
NOPLAT growth rate	12.7	18.0	(0.6)	6.7	8.5
Invested-capital growth rate	(2.6)	28.6	(0.5)	32.2	(5.6)
Net income growth rate	387.1	41.1	(1.2)	106.2	(53.2)
Investment rates					
Gross investment rate	15.8	85.0	35.1	63.9	34.9
Net investment rate	(28.8)	77.2	(0.5)	43.6	(0.5)
Financing					
Debt coverage (net debt/operating EBITDA)	3.5	3.0	3.3	4.5	3.6
Interest coverage (operating EBITA/interest expense)	3.3	4.2	4.9	4.6	5.0
Cash coverage (gross CF/interest)	3.6	4.6	5.6	5.4	5.5
Debt/total book capitalization	53.4	43.5	46.2	52.2	49.4

[1] Operating fixed assets = net property, plant, and equipment + operating intangibles + advances to customers.

Investments in goodwill and acquired intangibles The amount of investments in goodwill and acquired tangibles equals the annual change in the sum of goodwill and acquired intangibles and reversal of intangibles value adjustments in the invested-capital statement, plus the sum of after-tax amortization of acquired intangibles and impairment of acquired intangibles and goodwill for the year from the NOPLAT statement (see Chapter 18). For 2013, exchange rate and hyperinflation effects of €986 million are eliminated from these investments, as previously noted.

ANALYZING HISTORICAL PERFORMANCE

The next task is to analyze Heineken's historical performance in preparation for the forecast of the company's future cash flows. Exhibit 24.13 summarizes

EXHIBIT 24.14 **Heineken: Revenue Growth Analysis**

%

	2009	2010	2011	2012	2013	CAGR 2009–2013[1]
Organic volume growth	(4.7)	(3.3)	2.1	1.5	(3.5)	(1.6)
Price increase/mix change	4.5	1.1	1.5	2.4	2.6	2.4
Organic growth at constant currency	(0.2)	(2.2)	3.6	3.9	(0.9)	0.8
Acquisitions (first-time consolidations)	7.3	8.8	4.7	2.0	7.5	6.0
Currency movements	(4.4)	3.0	(2.2)	1.5	(2.1)	(0.9)
Accounting changes; other	0.0	0.1	0.0	0.0	0.0	(0.0)
Nominal revenue growth	2.7	9.7	6.1	7.4	4.5	6.0

[1] Compound annual growth rate in revenues from year-end 2008 to year-end 2013.

Heineken's key performance indicators for 2009 to 2013, including all the preceding adjustments to the financial statements.

Growth and ROIC Analysis

To evaluate Heineken's financial performance, we compare it with other large, publicly traded beer companies: AB InBev, SABMiller, Molson Coors, and Carlsberg.

From 2009 through 2013, Heineken increased its nominal revenues by 6.0 percent per year (see Exhibit 24.14). However, organic growth (volume, price increase, and product mix) was only 0.8 percent per year, well below the historical growth of global beer consumption. Acquisitions have delivered 6.0 percent growth per year. The remaining difference of around one percentage point is due to currency effects and accounting changes. Exhibit 24.15 compares Heineken's revenue growth with that of its key peers. Overall growth from 2009 to 2013 varies from 2.2 percent for Carlsberg to 14.6 percent for AB

EXHIBIT 24.15 **Beer Industry: Revenue Growth Analysis, 2009–2013**

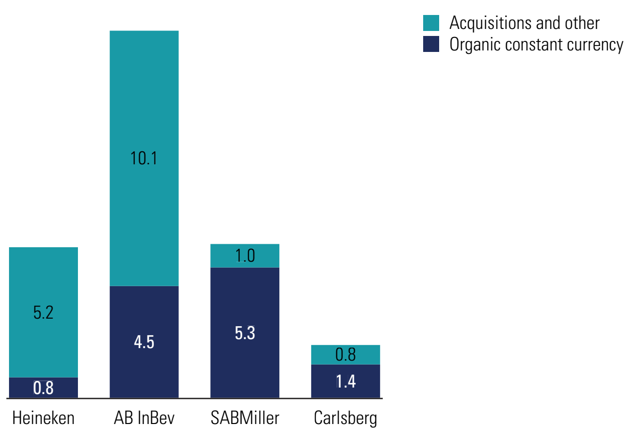


EXHIBIT 24.16 **Beer Industry: Value Drivers**

%

ROIC, including goodwill[1]	**2009**	**2010**	**2011**	**2012**	**2013**
Heineken	8.8	9.2	8.2	7.5	7.4
AB InBev	8.5	9.7	11.2	11.7	11.1
SABMiller	10.5	10.8	9.6	9.4	9.4
Molson Coors	5.2	5.8	5.7	4.8	4.3
Carlsberg	6.1	6.8	6.2	6.5	6.5
ROIC, excluding goodwill[1]					
Heineken	21.8	24.3	22.2	22.7	23.8
AB InBev	44.6	61.8	80.0	85.4	80.5
SABMiller	28.2	30.3	34.3	42.5	42.1
Molson Coors	30.5	35.0	31.7	27.5	27.4
Carlsberg	21.5	26.5	25.4	27.7	28.7
EBITA margin					
Heineken	14.0	15.5	14.1	13.9	15.0
AB InBev	26.4	29.7	31.2	31.1	30.9
SABMiller	23.1	24.6	25.1	27.8	27.4
Molson Coors	14.6	15.4	13.9	13.4	13.2
Carlsberg	16.1	16.9	15.0	14.8	15.0
Capital turnover, excluding goodwill[1]					
Heineken	2.1	2.2	2.1	2.2	2.2
AB InBev	2.1	2.6	3.2	3.3	3.1
SABMiller	1.7	1.7	1.9	2.1	2.1
Molson Coors	2.6	2.7	2.6	2.4	2.4
Carlsberg	1.8	2.1	2.2	2.4	2.5

[1] Using average invested capital.

InBev. These results are not entirely comparable, due to acquisitions, accounting changes, and currency effects. Nevertheless, organic growth rates also show considerable differences, ranging from 0.8 percent for Heineken to as much as 5.3 percent for SABMiller, thanks to its larger positions in emerging markets.

The differences in ROIC across the peers are also large and another key to explaining valuation differences. Heineken increased its ROIC, excluding goodwill, from 21.8 percent in 2009 to 23.8 percent in 2013 as its EBITA margin increased by one percentage point to 15.0 percent in 2013 and its capital turnover remained unchanged at 2.2 (see Exhibit 24.16). Nevertheless, Heineken has a low ROIC relative to this peer group, which could signal opportunities for improvements in operating performance. We also estimate Heineken's ROIC including goodwill to see the impact of acquisitions. Including goodwill reduces Heineken's ROIC roughly by two-thirds in 2013 to 7.4 percent, above the returns generated by Carlsberg and Molson Coors. Apparently Heineken has been relatively cautious when paying acquisition premiums.

Of the leading players, AB InBev has the best underlying operating performance by far, with ROIC before goodwill of over 80 percent since 2011. Its ROIC has almost doubled over the last five years, while Heineken and Carlsberg delivered much lower increases in their returns and Molson Coors saw its returns decline. An exception is SABMiller, which drove its ROIC from 28.2 percent in 2009 to 42.1 percent in 2013. Like AB InBev, SABMiller achieved its improvements in return on capital by increasing both margins and capital efficiency. AB InBev increased its EBITA margin from 26.4 percent in 2009 to 30.9 percent in 2013 and over the same years boosted its capital turnover from 2.1 to 3.1. SABMiller improved its margin from 23.1 percent to 27.4 percent in the same period, while driving its capital turnover from 1.7 to 2.1. The ROICs for these companies stand out because of the underlying high margins, which are at double the level of the other players in 2013. Including goodwill paid for acquisitions changes the picture somewhat: AB InBev and SABMiller still lead the table at 11.1 and 9.4 percent in 2013, respectively, but Heineken is not far behind at 7.4 percent. Note that AB InBev was the only company to achieve a significant improvement in its ROIC including goodwill throughout the years while a string of large acquisitions consolidated the industry.

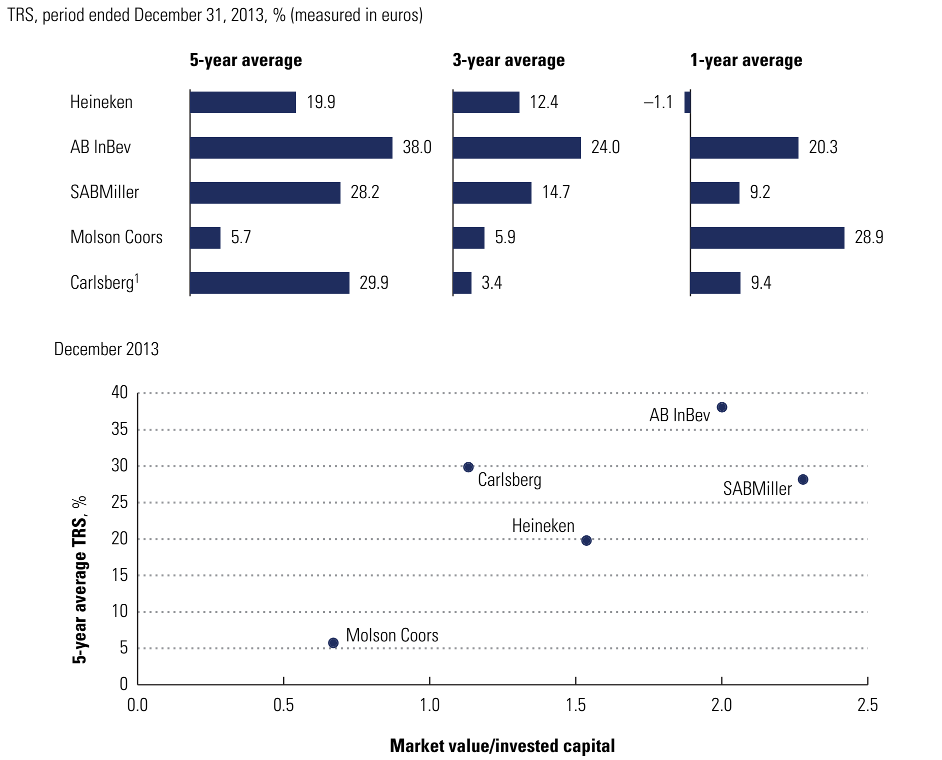
Technically, it would have been more correct to show ROIC and capital turnover for Heineken on a pro forma basis, adjusted for acquisitions. For example, Heineken completed its acquisition of Asia Pacific Breweries (APB) on November 15, 2012, so only 1.5 months of APB's results are included in Heineken's 2012 income statement. Obviously, the 2011 end-of-year balance sheet does not include any of APB's assets or liabilities. As a result, the 2012 average ROIC for Heineken could be distorted when calculated from its reported financials. To calculate a pro forma average ROIC for 2012, we should add the difference between 1.5 and 12 months of APB results to the Heineken income statement and add APB's invested capital to the end-of-year balance sheet for 2011. This would result in a pro forma ROIC excluding goodwill of 22.8 instead of 22.7 percent for 2012, a very small difference. Making the pro forma adjustments for 2010, the year of the FEMSA beer acquisition, Heineken's ROIC excluding goodwill would be 21.9 instead of 24.3 percent. As the adjustments for Heineken's two largest acquisitions of the last five years made such limited difference, we show average ROIC calculated following the standard approach.

Stock Market Performance

As an additional assessment of historical performance, we compare the stock market performance of these companies using two indicators: total returns to shareholders (TRS) and the ratio of market value to invested capital.

In terms of TRS, Heineken has been in the middle of the pack over the past five years (see Exhibit 24.17). Its shareholder returns have averaged 19.9

EXHIBIT 24.17 **Beer Industry: Stock Market Performance**

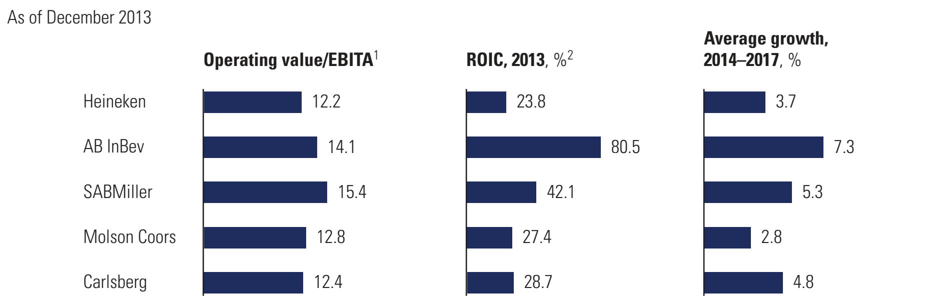


[1] Based on the B shares, for which there is a more liquid market than the A shares.

percent per year, lower than AB InBev, at 38.0 percent, Carlsberg at 29.9 percent, and SABMiller at 28.2 percent. (These returns are all measured in euros to reflect the viewpoint of an international investor.) As noted in the previous section, these competitors were able to improve their ROICs before goodwill by more than Heineken over this time frame, thereby generating significant returns for their shareholders. The main exception was Molson Coors, which saw its ROIC decline over the five-year period and as a result generated no more than 5.7 percent TRS.

We also compare Heineken's ratio of market enterprise value to invested capital with those of its peers. Comparing the market value of a company's debt and equity to the amount of capital invested, this ratio measures the market's perception of the company's ability to create wealth. The scatter plot on the bottom of Exhibit 24.17 shows TRS and the ratio of market value to invested capital simultaneously. Again, Heineken shows up in the middle of the pack, behind AB InBev and SABMiller but ahead of Molson Coors and Carlsberg at a market value/invested capital ratio of 1.5. This means the market assigns a value of €1.50 for every euro invested in the company. Note how Carlsberg provides an

EXHIBIT 24.18 **Beer Industry: Value Multiples**



[1] Based on consensus forecast EBITA for 2014.
[2] Excluding goodwill and using average invested capital.

interesting illustration of the expectations treadmill. Although Carlsberg generated the second-highest TRS in this group, its current valuation levels are still relatively low: it was the improvement from an even lower valuation level in 2008 that drove its TRS over the last years. Carlsberg's ratio of market value to invested capital increased from 0.7 in 2008 to 1.1 in 2013 as it improved its ROIC from 21.5 percent to 28.7 percent over the same period. Carlsberg was one of the best investments for shareholders in this group, but clearly not the best-performing business.

According to the analysts' consensus estimates, Heineken is valued at 12.2 times its 2014 expected EBITA, similar to Carlsberg and Molson Coors, whose ROICs and growth outlooks are in the same range (see Exhibit 24.18). Note that AB InBev and SABMiller are valued significantly higher, at 14.1 and 15.4 times 2014 EBITA, respectively, reflecting these companies' prospects for higher growth and especially higher returns on capital for the next three years, compared with the other leading brewers.

FORECASTING PERFORMANCE

We develop our performance forecast following the approach laid out in Chapter 11. First, we describe three alternative strategic scenarios for Heineken. We then translate the base case scenario into a financial forecast. For this case study, we use a five-year detailed forecast, followed by a summary forecast for 10 years. The continuing value follows after the 15-year explicit forecast period (discussed in Chapter 12).

Creating Scenarios

For valuing Heineken, we develop three scenarios that can describe the company's potential strategy and business climate:

1. *Business as usual:* Under the business-as-usual scenario, the industry experiences no major shocks, Heineken continues to grow organically at a modest rate, and its margins and capital efficiency remain constant at 2013 levels.
2. *Business improvement:* In this scenario, Heineken rigorously improves its operations and increases its margins by as much as six percentage points in 2018, thereby closing half of the performance gap with SABMiller, its nearest competitor in size.
3. *Aggressive acquisition:* Heineken and its competitors accelerate their growth through more acquisitions, further consolidating the industry. This strategy drives up acquisition prices, reducing returns on capital including goodwill.

For the remainder of this section, we analyze only the business-as-usual scenario in detail but the same procedure applies to the other scenarios. The resulting valuations of the other two scenarios are summarized at the end of this chapter.

Short-Term Forecasting

We typically create an explicit forecast of 10 to 15 years, so the company can reach a steady-state financial performance before we apply a continuing value. We divide the explicit forecast period into two subperiods. For the first subperiod (five years in Heineken's case), we forecast complete income statements and balance sheets. For the remaining subperiod (10 years in Heineken's case), we use a condensed forecast.

As with most forecasts, we derive most income statement and balance sheet line items from the revenue forecast. For the income statement items, the detailed forecast assumptions for the first five years are laid out in Exhibit 24.19.

- *Revenue:* The projected revenue growth rate is the sum of volume growth, changes in price and product mix, currency effects, and growth from acquisitions. In 2013, Heineken experienced a drop in volume of 3.5 percent, but for the next five years, we project volume growth to return to its long-term historical average of around 1.5 percent. This is somewhat lower than the industry rate of 2.0 percent because of Heineken's larger presence in mature markets. The geographic mix of sales also affects average prices realized, since prices are lower in emerging markets. We forecast effective price increases to stay at their long-term average of around 2.5 percent. Finally, we assume no acquisitions for Heineken in the base case.

EXHIBIT 24.19 **Heineken: Income Statement Forecast Assumptions**

	Historical				Forecast				
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenue growth, %									
Organic volume growth	(3.3)	2.1	1.5	(3.5)	1.5	1.5	1.5	1.5	1.5
Price increase/mix change	1.1	1.5	2.4	2.6	2.5	2.5	2.5	2.5	2.5
Organic growth at constant currency	(2.2)	3.6	3.9	(0.9)	4.0	4.0	4.0	4.0	4.0
Acquisitions (first-time consolidations)	8.8	4.7	2.0	7.5	–	–	–	–	–
Currency movements	3.0	(2.2)	1.5	(2.1)	–	–	–	–	–
Accounting changes; other	0.1	–	–	–	–	–	–	–	–
Nominal revenue growth	9.7	6.1	7.4	4.5	4.0	4.0	4.0	4.0	4.0
Operating expense ratios, %									
Raw materials/revenues	63.8	64.0	64.5	63.5	63.5	63.5	63.5	63.5	63.5
Personnel expense/revenues	15.0	16.2	15.8	15.8	15.8	15.8	15.8	15.8	15.8
Depreciation/assets	14.8	12.2	12.9	12.1	12.1	12.1	12.1	12.1	12.1
Amortization of operating intangibles/assets	44.2	26.5	34.8	16.6	16.6	16.6	16.6	16.6	16.6
Amortization of acquired intangibles/assets	9.7	5.6	6.3	5.0	5.0	5.0	5.0	5.0	5.0
Interest rates, %									
Interest income/excess cash and other financial assets	12.4	6.5	4.3	2.8	2.8	2.8	2.8	2.8	2.8
Interest expense/financial debt	6.5	5.3	4.1	4.7	4.0	4.0	4.0	4.0	4.0
Net interest/retirement liability	5.7	2.3	0.7	3.6	4.0	4.0	4.0	4.0	4.0
Taxes, %									
Statutory domestic tax rate	25.5	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Blended global tax rate	26.8	27.6	27.4	27.8	27.8	27.8	27.8	27.8	27.8
Operating cash tax rate	28.8	26.5	26.2	29.0	27.8	27.8	27.8	27.8	27.8
Noncontrolling interests, %									
Income to noncontrolling interests/operating EBITA	5.3	5.4	6.3	7.7	7.7	7.7	7.7	7.7	7.7
Dividends									
Dividends/net income (BEIA)[1]	21.7	29.6	27.3	31.3	30.0	30.0	30.0	30.0	30.0
Dividends to NCI holders/income to NCI[2]	104.5	74.6	68.8	83.0	83.0	83.0	83.0	83.0	83.0
Other									
Income from associates/nonconsolidated assets, %	13.5	14.3	12.1	7.5	7.5	7.5	7.5	7.5	7.5
Other net finance income (expenses), € million	(19)	(6)	219	(61)	–	–	–	–	–

[1] Before exceptional items and amortization.
[2] NCI is noncontrolling interest.

- *Operating expenses:* We forecast raw materials and personnel expenses as a percentage of revenues equal to the 2013 levels. We assume depreciation and the amortization of acquired intangibles remain at constant ratios of assets, also at 2013 levels. The ratio of amortization of operating intangibles to operating intangible assets has come down over the last years, from a peak of 44.2 percent in 2010 to a trough of 16.6 in 2013, albeit with some strong fluctuations. We assume that this ratio is sustainable at the 2013 level.

- *Interest expense and income:* In the financial model, we estimate each year's interest expense based on the level of debt at the beginning of that year, rather than the average for the year, to avoid circular calculations. We forecast the interest rate on Heineken's debt to be 4 percent, its own projected near-term borrowing rate as of 2013. This is somewhat below its five-year historical average rate, as the company is renewing its outstanding loans at current, lower interest rates, according to its 2013 annual report. The interest rate on the net defined-benefit obligation is estimated to be equal to Heineken's borrowing rate and included in other net finance results. For the interest income from excess marketable securities and other financial assets, we use the 2013 rate of return of 2.8 percent. Note that these assumptions do not affect the DCF valuation of Heineken.
- *Taxes:* We estimate Heineken's marginal tax rate at 25 percent, the statutory tax rate in the Netherlands. We figure Heineken's cash tax rate on operating profits at its last five years' average level of 27.8 percent, equal to the 2013 blended global rate.[5]
- *Noncontrolling interests (minority interests):* Profits to noncontrolling interests are the earnings of consolidated subsidiaries that accrue to minority shareholders in those subsidiaries. We project these to remain constant at the 2013 level of 7.7 percent of operating EBITA.
- *Dividends:* As stated in the 2013 annual report, Heineken targets a 30 percent payout ratio of dividends to net income before exceptional items and amortization of acquired intangibles. For dividends to noncontrolling-interest holders, we assume a constant payout ratio of 83 percent of profits to noncontrolling interests (equal to the 2013 payout ratio, which is also close to the average over the prior five years).
- *Income from associates:* The income from associates and joint ventures represents Heineken's share of the income of nonconsolidated investments in affiliates and joint ventures. We assume that future income will remain at the 2013 level of 7.5 percent of nonconsolidated assets.

For the following balance sheet items, the detailed forecast ratios are shown in Exhibit 24.20.

- *Working capital:* From 2010 to 2013, net working capital has steadily improved from –1.2 to –3.0 percent of revenues. We forecast that net working capital will remain at 2013 levels of –3.0 percent of net revenues. Exhibit 24.20 also shows forecasts for individual working-capital items, expressed in days' sales.

[5]Note that the future changes in operating deferred taxes are implied by our assumptions for the blended global tax rate and the cash operating tax rate.

EXHIBIT 24.20 **Heineken: Balance Sheet Forecast Assumptions**

Year-end balance sheet

	Historical				Forecast				
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Working capital									
Working cash, % of revenues	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Trade receivables, days	51.2	47.4	49.6	45.3	45.3	45.3	45.3	45.3	45.3
Inventories, days	27.3	28.8	31.7	28.7	28.7	28.7	28.7	28.7	28.7
Prepayments and accrued income, days	4.7	3.6	4.6	4.1	4.1	4.1	4.1	4.1	4.1
Trade payables, days	37.6	42.8	44.6	40.7	40.7	40.7	40.7	40.7	40.7
Accruals and deferred income, days	20.6	19.6	23.1	19.9	19.9	19.9	19.9	19.9	19.9
Other current operating liabilities, days	36.8	34.2	37.1	35.9	35.9	35.9	35.9	35.9	35.9
Total working capital, % of revenues	(1.2)	(2.6)	(3.1)	(3.0)	(3.0)	(3.0)	(3.0)	(3.0)	(3.0)
Fixed assets, % of revenues									
Net property, plant, and equipment	47.6	45.9	47.8	44.0	44.0	44.0	44.0	44.0	44.0
Other noncurrent operating assets	2.8	2.1	1.7	1.6	1.6	1.6	1.6	1.6	1.6
Operating intangibles	0.8	0.8	1.2	1.1	1.1	1.1	1.1	1.1	1.1
Other assets, € million									
Nonconsolidated investments	1,673	1,764	1,950	1,883	1,883	1,883	1,883	1,883	1,883
Other financial assets	796	955	1,039	583	583	583	583	583	583
Tax loss carryforwards	213	237	238	220	220	220	220	220	220
Investments in goodwill and acquired intangibles	3,217	351	6,134	(122)	–	–	–	–	–
Other liabilities									
Postretirement benefit liabilities, net of assets, % of revenues	4.3	6.9	8.9	6.3	6.3	6.3	6.3	6.3	6.3
Other nonoperating provisions, € million	486	438	409	374	374	374	374	374	374
Restructuring provisions, € million	112	151	138	164	164	164	164	164	164
Dividends payable, % of dividends	13.8	6.7	8.2	6.0	6.0	6.0	6.0	6.0	6.0
Interest payable, % of debt	1.1	1.1	2.2	1.4	1.4	1.4	1.4	1.4	1.4

- *Fixed assets:* Over the years preceding 2013, Heineken's ratios of net PP&E to revenues varied between 44 and 48 percent. Before 2009, this ratio was at levels closer to 40 percent, and we forecast that Heineken will be able to retain the 2013 level of 44 percent. We also keep the level of other noncurrent operating assets (advances to customers) and operating intangible assets (software) at their 2013 levels of 1.6 and 1.1 percent of revenues, respectively.
- *Nonconsolidated investments (investments in associates and joint ventures):* We keep the value of nonconsolidated investments equal to the 2013 level, since we do not forecast further expansion of Heineken's equity holdings.
- *Other financial assets:* Other financial assets consist of investments and loans to customers. We assume these remain constant.
- *Tax loss carryforwards:* We keep tax loss carryforwards constant in our balance sheet projections. This does not affect our valuation result, as the

value of tax loss carryforwards is separately added to the DCF value of operations.

- *Investments in goodwill and acquired intangibles:* Since our forecast of revenue growth in the base case does not include acquisitions, we forecast no investments in goodwill or intangibles associated with the acquisitions.
- *Postretirement benefit liabilities:* The postretirement benefit liabilities are equal to the difference between the company's retirement assets and the actuarial liability for current and former employees. This item is very difficult to forecast, and we assume it grows with revenues (note that this assumption has no impact on the valuation).
- *Other nonoperating and restructuring provisions:* We project that Heineken will keep these provisions at the same level as in 2013.
- *Dividends payable and interest payable:* We project these short-term liabilities at their 2013 ratio to dividends and debt, respectively.

In addition, we make the following assumptions (not shown in Exhibit 24.20):

- *Reversal of intangibles value adjustment:* We project this adjustment to decrease annually by an amount equal to the operating tax rate times the annual amortization of acquired intangibles, as the deferred-tax liability is drawn down with the amortization of the intangibles (see Chapter 18). Note that the total of goodwill and acquired intangibles, including the value adjustment reversal and cumulative amortization and impairment, remains constant, as no acquisitions are forecast (see the invested-capital forecast exhibit, shown shortly).
- *Short- and long-term debt:* Short-term debt includes both debt due within one year and the current portion of long-term debt. We assume that short-term debt is held constant for the next five years, while any financing need or surplus is reflected in the change in long-term debt.
- *Noncontrolling interest:* Noncontrolling interest on the balance sheet increases each year by the noncontrolling interest on the income statement less the projected dividends to noncontrolling shareholders, which we estimate at a constant payout ratio of 83 percent of profits to noncontrolling interests.

Exhibits 24.21 to 24.24 show the resulting projections for NOPLAT, invested capital, free cash flow, and economic profit for the years 2014 to 2018.

EXHIBIT 24.21 **Heineken: NOPLAT and Shareholders' Equity Forecast**

€ million

	Historical	Forecast				
	2013	2014	2015	2016	2017	2018
Revenues	19,203	19,971	20,770	21,601	22,465	23,363
Raw materials	(12,186)	(12,673)	(13,180)	(13,708)	(14,256)	(14,826)
Personnel expense	(3,026)	(3,147)	(3,273)	(3,404)	(3,540)	(3,682)
Operating EBITDA	3,991	4,151	4,317	4,489	4,669	4,856
Depreciation	(1,073)	(1,026)	(1,067)	(1,109)	(1,154)	(1,200)
Amortization of operating intangibles	(37)	(36)	(38)	(39)	(41)	(42)
Operating EBITA	2,881	3,089	3,212	3,341	3,474	3,613
Operating cash taxes	(835)	(858)	(893)	(928)	(966)	(1,004)
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609
Operating cash taxes						
Income tax at blended global rate	(801)	(858)	(893)	(928)	(966)	(1,004)
(Increase) decrease in operating deferred-tax liabilities	(34)	–	–	–	–	–
Operating cash taxes	(835)	(858)	(893)	(928)	(966)	(1,004)
Reconciliation to net profit						
Net profit	1,364	1,580	1,708	1,831	1,960	2,093
Income to noncontrolling interests	223	239	249	259	269	280
Nonoperating taxes	(281)	(248)	(232)	(219)	(206)	(192)
(Decrease) increase in operating deferred-tax liabilities	(34)	–	–	–	–	–
Interest expense	579	489	413	372	327	279
Interest income	(47)	(25)	–	–	–	–
Other net finance income (expenses)	61	48	50	52	54	56
Share of profit of associates and joint ventures	(146)	(141)	(141)	(141)	(141)	(141)
Gain (loss) on sale of fixed assets	(226)	–	–	–	–	–
Amortization of acquired intangibles	339	287	273	259	246	234
Impairment of goodwill, acquired intangibles	99	–	–	–	–	–
Impairments of PP&E, operating intangibles	33	–	–	–	–	–
Restructuring expenses	99	–	–	–	–	–
Additions to other nonoperating provisions[1]	25	–	–	–	–	–
Other exceptional expenses	–	–	–	–	–	–
Net pension adjustments to personnel expenses	(42)	–	–	–	–	–
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609
Shareholders' equity						
Position as of January 1	11,734	11,402	12,422	13,535	14,739	16,037
Net profit	1,364	1,580	1,708	1,831	1,960	2,093
Other net recognized income and expenses	(1,028)	–	–	–	–	–
Dividends	(530)	(560)	(594)	(627)	(662)	(698)
Purchase of own/noncontrolling shares, net of shares issued	(146)	–	–	–	–	–
Share-based payments	8	–	–	–	–	–
Position as of December 31	11,402	12,422	13,535	14,739	16,037	17,432

[1] Net of reversals.

EXHIBIT 24.22 **Heineken: Invested-Capital Forecast**

€ million

	Historical	Forecast				
	2013	2014	2015	2016	2017	2018
Working cash	384	399	415	432	449	467
Trade receivables	2,382	2,477	2,576	2,679	2,787	2,898
Inventories	1,512	1,572	1,635	1,701	1,769	1,840
Prepayments and accrued income	218	227	236	245	255	265
Operating current assets	4,496	4,676	4,863	5,057	5,260	5,470
Trade payables	(2,140)	(2,226)	(2,315)	(2,407)	(2,503)	(2,604)
Accruals and deferred income	(1,047)	(1,089)	(1,132)	(1,178)	(1,225)	(1,274)
Other operating liabilities	(1,888)	(1,964)	(2,042)	(2,124)	(2,209)	(2,297)
Operating current liabilities	(5,075)	(5,278)	(5,489)	(5,709)	(5,937)	(6,175)
Operating working capital	(579)	(602)	(626)	(651)	(677)	(704)
Net property, plant, and equipment	8,454	8,792	9,144	9,510	9,890	10,286
Operating intangibles	218	227	236	245	255	265
Other operating noncurrent assets	301	313	326	339	352	366
Invested capital without goodwill	8,394	8,730	9,079	9,442	9,820	10,213
Goodwill and acquired intangibles[1]	14,482	14,274	14,077	13,890	13,712	13,544
Cumulative amortization and unrecorded goodwill	4,116	4,323	4,520	4,708	4,885	5,054
Invested capital with goodwill	26,992	27,328	27,677	28,040	28,418	28,810
Excess cash	906	–	–	–	–	–
Nonconsolidated investments	1,883	1,883	1,883	1,883	1,883	1,883
Other financial assets	583	583	583	583	583	583
Tax loss carryforwards	220	220	220	220	220	220
Total funds invested	30,584	30,014	30,363	30,726	31,104	31,496
Shareholders' equity	11,402	12,422	13,535	14,739	16,037	17,432
Dividends payable	36	43	44	47	50	52
Operating deferred-tax liabilities, net of assets	517	517	517	517	517	517
Nonoperating deferred-tax liabilities, net of assets	(595)	(595)	(595)	(595)	(595)	(595)
Cumulative amortization and unrecorded goodwill	4,116	4,323	4,520	4,708	4,885	5,054
Equity and equivalents	15,476	16,710	18,022	19,416	20,894	22,461
Short-term debt	2,373	2,373	2,373	2,373	2,373	2,373
Long-term debt	9,853	7,964	6,927	5,806	4,613	3,343
Interest payable	188	170	144	130	114	97
Postretirement benefit liabilities, net of assets	1,202	1,250	1,300	1,352	1,406	1,462
Other nonoperating provisions	374	374	374	374	374	374
Restructuring provisions	164	164	164	164	164	164
Noncontrolling interests	954	1,008	1,058	1,111	1,165	1,222
Debt and equivalents	15,108	13,304	12,340	11,310	10,209	9,036
Total funds invested	30,584	30,014	30,363	30,726	31,104	31,496

[1] Net of reversal of intangibles value adjustment.

EXHIBIT 24.23 **Heineken: Forecast of Free Cash Flow**

€ million

	Historical	Forecast				
	2013	**2014**	**2015**	**2016**	**2017**	**2018**
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609
Depreciation and amortization of operating intangibles	1,110	1,062	1,104	1,149	1,194	1,242
Gross cash flow	3,156	3,292	3,424	3,561	3,703	3,851
Investment in operating working capital	(11)	23	24	25	26	27
Capital expenditures (net of disposals)	(715)	(1,409)	(1,465)	(1,524)	(1,585)	(1,648)
Investments in other operating noncurrent assets	11	(12)	(13)	(13)	(14)	(14)
Impairments of PP&E, operating intangibles	(33)	–	–	–	–	–
Effect of exchange rate changes and hyperinflation on PP&E	(352)	–	–	–	–	–
Gross investment	(1,100)	(1,398)	(1,454)	(1,512)	(1,572)	(1,635)
Free cash flow before goodwill	2,056	1,895	1,970	2,049	2,131	2,216
Investments in goodwill and acquired intangibles[1]	1,108	–	–	–	–	–
Effect of exchange rates changes on goodwill and acquired Intangibles	(986)	–	–	–	–	–
Free cash flow after goodwill	2,178	1,895	1,970	2,049	2,131	2,216
Restructuring expenses	(99)	–	–	–	–	–
Increase (decrease) in restructuring provisions	26	–	–	–	–	–
Additions to other nonoperating provisions, net of reversals	(25)	–	–	–	–	–
Increase (decrease) in other nonoperating provisions	(36)	–	–	–	–	–
Other exceptional expenses	–	–	–	–	–	–
Gain (loss) on disposals	226	–	–	–	–	–
Interest income	47	25	–	–	–	–
Income from nonconsolidated investments	146	141	141	141	141	141
Other net finance income (expenses)	(61)	(48)	(50)	(52)	(54)	(56)
Net investment in nonconsolidated investments	67	–	–	–	–	–
Net investment in other financial assets	456	–	–	–	–	–
Decrease (increase) in excess cash	(237)	906	–	–	–	–
Change in currency translation reserve[2]	57	–	–	–	–	–
Other comprehensive income (excluding translation effects)[3]	166	–	–	–	–	–
Taxes on nonoperating items[4]	182	168	156	147	138	127
Decrease (increase) in tax loss carryforwards	18	–	–	–	–	–
Increase (decrease) in operating deferred tax liabilities, net of assets[5]	(56)	–	–	–	–	–
Increase (decrease) in nonoperating deferred tax liabilities, net of assets[6]	67	–	–	–	–	–
Nonoperating cash flow	945	1,192	247	236	224	212
Cash flow available to investors	3,123	3,086	2,218	2,286	2,356	2,428
Increase (decrease) in postretirement benefit liabilities, net of assets	331	(48)	(50)	(52)	(54)	(56)
Interest expense	579	489	413	372	327	279
Decrease (increase) in short-term debt	(303)	18	26	14	16	17
Decrease (increase) in long-term debt	1,584	1,889	1,037	1,121	1,193	1,270
Flow to (from) debt holders	2,191	2,347	1,427	1,455	1,482	1,510
Dividends to noncontrolling interest holders	185	185	198	206	215	223
Other decrease (increase) in noncontrolling interests	68	–	–	–	–	–
Dividends to shareholders	530	560	594	627	662	698
Decrease (increase) in dividends payable	11	(7)	(2)	(3)	(2)	(3)
Decrease (increase) in share capital	138	–	–	–	–	–
Flow to (from) equity holders	932	739	791	831	874	919
Cash flow available to investors	2,946	3,086	2,218	2,286	2,356	2,428

[1] Includes reversal of intangibles adjustment.
[2] Excludes changes related to PP&E, goodwill, and acquired intangibles.
[3] Net of pension adjustments to personnel expenses.
[4] Includes tax on amortization of grossed-up acquired intangibles.
[5] Excludes changes in operating deferred-tax liabilities included in operating cash taxes.
[6] Excludes changes in deferred-tax liabilities related to acquired intangible assets.

EXHIBIT 24.24 **Heineken: Forecast of Economic Profit**

€ million

	Historical	Forecast				
Before goodwill	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
After-tax ROIC, %	23.3	26.6	26.6	26.6	26.6	26.6
WACC, %	8.3	8.3	8.3	8.3	8.3	8.3
Spread, %	15.0	18.3	18.3	18.3	18.3	18.3
Invested capital, beginning of year	8,789	8,394	8,730	9,079	9,442	9,820
Economic profit	1,317	1,534	1,595	1,659	1,725	1,794
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609
Capital charge	(729)	(697)	(725)	(754)	(784)	(815)
Economic profit	1,317	1,534	1,595	1,659	1,725	1,794
After goodwill						
After-tax ROIC, %	7.2	8.3	8.5	8.7	8.9	9.2
WACC, %	8.3	8.3	8.3	8.3	8.3	8.3
Spread, %	(1.1)	(0.0)	0.2	0.4	0.6	0.9
Invested capital, beginning of year	28,592	26,992	27,328	27,677	28,040	28,418
Economic profit	(327)	(10)	51	115	182	251
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609
Capital charge	(2,373)	(2,240)	(2,268)	(2,297)	(2,327)	(2,359)
Economic profit	(327)	(10)	51	115	182	251

Midterm Forecasting

For the years 2019 to 2028, we use a streamlined model, projecting only core value drivers such as net revenue growth, EBITA margin, and the ratio of revenues to invested capital. Our forecast assumes that Heineken reaches a steady state beginning in 2019, with constant growth at 3.5 percent, margins at 15.5 percent, and ROIC excluding goodwill at 25.5 percent. We could have applied the continuing value at this point but instead present the 10-year forecast to illustrate what the streamlined forecast looks like. The assumptions are laid out in Exhibit 24.25, and the resulting summary financial statements appear in Exhibit 24.26.

ESTIMATING COST OF CAPITAL

Our estimate of Heineken's weighted average cost of capital (WACC) is 8.3 percent, as shown in Exhibit 24.27. This estimate is based on a target market value capital structure of 30 percent debt to 70 percent equity, with the cost of equity at 10.1 percent and pretax cost of debt at 5.2 percent.

EXHIBIT 24.25 **Heineken: Medium-Term Operating Ratios**

%

	Historical	Forecast														
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenue growth	4.5	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Operating EBITA margin	15.0	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Operating cash tax rate	29.0	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
Revenues/average invested capital, times	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Revenues/end-of-year invested capital, times	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Average invested capital																
Pretax ROIC (average invested capital)	33.5	36.1	36.1	36.1	36.1	36.1	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
After-tax ROIC (average invested capital)	23.8	26.1	26.1	26.1	26.1	26.1	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0
After-tax ROIC including goodwill (average invested capital)	7.4	8.2	8.4	8.7	8.9	9.1	9.3	9.5	9.7	9.9	10.2	10.4	10.6	10.8	11.0	11.2
End-of-year invested capital																
Pretax ROIC (end-of-year invested capital)	34.3	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
After-tax ROIC (end-of-year invested capital)	24.4	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
After-tax ROIC including goodwill (end-of-year invested capital)	7.6	8.2	8.4	8.6	8.8	9.1	9.3	9.5	9.7	9.9	10.1	10.3	10.5	10.7	10.9	11.2

EXHIBIT 24.26 **Heineken: Medium-Term Forecasts**

€ million

	Historical	Forecast														
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Revenues	19,203	19,971	20,770	21,601	22,465	23,363	24,181	25,027	25,903	26,810	27,748	28,720	29,725	30,765	31,842	32,956
Operating EBITA	2,881	3,089	3,212	3,341	3,474	3,613	3,740	3,871	4,006	4,147	4,292	4,442	4,597	4,758	4,925	5,097
Operating cash taxes	(835)	(858)	(893)	(928)	(966)	(1,004)	(1,039)	(1,076)	(1,113)	(1,152)	(1,193)	(1,234)	(1,278)	(1,322)	(1,369)	(1,417)
NOPLAT	2,046	2,230	2,320	2,412	2,509	2,609	2,701	2,795	2,893	2,994	3,099	3,207	3,320	3,436	3,556	3,681
Invested capital without goodwill	8,394	8,730	9,079	9,442	9,820	10,213	10,570	10,940	11,323	11,719	12,129	12,554	12,993	13,448	13,919	14,406
Invested capital with goodwill	26,992	27,328	27,677	28,040	28,418	28,810	29,168	29,538	29,921	30,317	30,727	31,152	31,591	32,046	32,517	33,004
NOPLAT		2,230	2,320	2,412	2,509	2,609	2,701	2,795	2,893	2,994	3,099	3,207	3,320	3,436	3,556	3,681
(Increase) decrease in invested capital without goodwill		(336)	(349)	(363)	(378)	(393)	(357)	(370)	(383)	(396)	(410)	(425)	(439)	(455)	(471)	(487)
Free cash flow before goodwill		1,895	1,970	2,049	2,131	2,216	2,343	2,425	2,510	2,598	2,689	2,783	2,880	2,981	3,085	3,193
NOPLAT		2,230	2,320	2,412	2,509	2,609	2,701	2,795	2,893	2,994	3,099	3,207	3,320	3,436	3,556	3,681
(Increase) decrease in invested capital with goodwill		(336)	(349)	(363)	(378)	(393)	(357)	(370)	(383)	(396)	(410)	(425)	(439)	(455)	(471)	(487)
Free cash flow after goodwill		1,895	1,970	2,049	2,131	2,216	2,343	2,425	2,510	2,598	2,689	2,783	2,880	2,981	3,085	3,193
NOPLAT		2,230	2,320	2,412	2,509	2,609	2,701	2,795	2,893	2,994	3,099	3,207	3,320	3,436	3,556	3,681
Capital charge before goodwill		(697)	(725)	(754)	(784)	(815)	(848)	(877)	(908)	(940)	(973)	(1,007)	(1,042)	(1,078)	(1,116)	(1,155)
Economic profit before goodwill		1,534	1,595	1,659	1,725	1,794	1,853	1,918	1,985	2,054	2,126	2,201	2,278	2,357	2,440	2,525
NOPLAT		2,230	2,320	2,412	2,509	2,609	2,701	2,795	2,893	2,994	3,099	3,207	3,320	3,436	3,556	3,681
Capital charge after goodwill		(2,240)	(2,268)	(2,297)	(2,327)	(2,359)	(2,391)	(2,421)	(2,452)	(2,483)	(2,516)	(2,550)	(2,586)	(2,622)	(2,660)	(2,699)
Economic profit after goodwill		(10)	51	115	182	251	309	374	441	511	583	657	734	814	896	982

EXHIBIT 24.27 **Heineken: Weighted Average Cost of Capital**

%

	Target capital structure	Cost	Tax benefit	Weighted cost
Debt	30.0	5.2	25.0	1.2
Common equity	70.0	10.1		7.1
Total	100.0			8.3

Our estimate of Heineken's target capital structure is based on historical analysis. Heineken's end-of-2013 capital structure using market values is 28.8 percent debt to 71.2 percent equity, as shown in Exhibit 24.28. Over the last 10 years, Heineken has had 30 percent debt on average—significantly higher than the 7 percent average debt level in the decade before 2003. This step-up in leverage was largely the result of a more aggressive acquisition strategy and higher cash payouts to shareholders. We assume Heineken will target a long-term capital structure of 30 percent debt.

Capital Structure

Exhibit 24.28 presents Heineken's year-end 2013 capital structure in book values and market values. The book values are shown both excluding and including any related deferred-tax assets and liabilities. These are presented for reference only, as we used market values in estimating Heineken's target capital structure. We estimated market values for the capital structure components as follows:

- *Short-term debt:* Short-term debt matures within one year, so in most cases, book value approximates market value.

EXHIBIT 24.28 **Heineken: Capital Structure**

%

	Book value, € million	Book value, net of DTAs/DTLs, € million	% of total book value, net of DTAs/DTLs	Market value, € million	% of total capitalization
Short-term debt[1]	2,561	2,561	8.8	2,561	5.8
Long-term debt	9,853	9,852	33.7	9,853	22.2
Postretirement benefit liabilities, net of assets	1,202	887	3.0	900	2.0
Other nonoperating provisions	538	437	1.5	404	0.9
Excess cash	(906)	(906)	(3.1)	(906)	(2.0)
Total debt	13,248	12,831	43.9	12,812	28.8
Shareholders' equity	15,476	15,476	52.9	28,226	63.6
Noncontrolling interest	954	954	3.3	3,372	7.6
Total equity	16,430	16,430	56.1	31,598	71.2
Total capitalization	29,678	29,261	100.0	44,410	100.0

[1] Including interest payable.

EXHIBIT 24.29 **Heineken: Pension Liability Recognized in the Balance Sheet**

€ million

	2012	2013
Present value of unfunded defined-benefit obligations	113	306
Present value of funded defined-benefit obligations	7,788	7,368
Total present value of defined-benefit obligations	7,901	7,674
Fair value of defined-benefit plan assets	(6,401)	(6,553)
Present value of net obligations	1,500	1,121
Asset ceiling items	1	2
Recognized liability for defined-benefit obligations	1,501	1,123
Other long-term employee benefits	131	79
Total	1,632	1,202

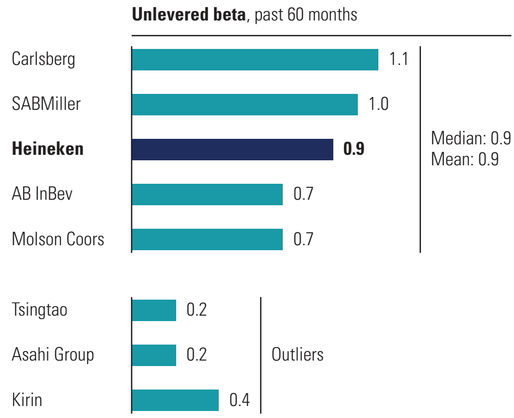
- *Long-term debt:* Given Heineken's sound capital structure, even after its leverage increase over the last five years, we assume that the book value of the long-term debt approximates market value.
- *Postretirement benefit liabilities:* As Exhibit 24.29 shows, the balance sheet position at €1,202 million in 2013 is practically identical to the present value of its net obligations plus other long-term employee benefits. To estimate the market value of its retirement-related liabilities at €900 million, we exclude the asset ceiling items of €2 million and apply Heineken's statutory tax rate to the resulting deficit of €1,200 million.
- *Nonoperating provisions:* We estimate the market value of the nonoperating provisions by taking the book value and applying the statutory tax rate of 25 percent.
- *Shareholders' equity:* At year-end 2013, the market value of Heineken's equity was €28.2 billion.
- *Noncontrolling interest:* To estimate a market value for noncontrolling interest, we apply a peer-average price-to-earnings (P/E) multiple of 15 to Heineken's noncontrolling-interest income. Given noncontrolling-interest income in 2013 of €223 million, we estimate the market value of noncontrolling interests to be €3.4 billion.

Cost of Debt

As of December 2013, Heineken had a BBB+ credit rating by Standard & Poor's. In European Union countries, the default premium for BBB+-rated, investment-grade companies has historically been around 100 basis points. Following the approach from Chapter 13, we estimate the long-term euro risk-free rate at 4.2 percent—its average over the years preceding the 2009 credit crisis. Based on the long-term risk-free rate, we estimate the cost of debt for Heineken at 5.2 percent before taxes, or 3.9 percent after taxes.

EXHIBIT 24.30 **Beer Industry: Unlevered Betas**

As of December 2013



Cost of Equity

Using the capital asset pricing model, we estimate Heineken's cost of equity to be 10.1 percent based on a long-term euro risk-free rate of 4.2 percent, a market risk premium of 5.0 percent, and a levered beta of approximately 1.2. The levered beta is based on the median of the unlevered betas for a sample of the world's largest brewers by market cap, relevered to Heineken's target capital structure (debt-to-value ratio of 30 percent). Excluding some of the Asian brewers with significantly lower betas, the leading players in the brewing industry have unlevered betas in a range of 0.7 to 1.1, and the median is 0.9, almost identical to the mean (see Exhibit 24.30). To unlever and relever the betas, we use the formula $\beta_l = \beta_u \times (1 + D/E)$, as explained in Appendix C.

As mentioned earlier, individual companies' betas are difficult to measure, so we typically use the industry median rather than an individual company's measured beta unless there are specific reasons to believe that the company's beta should differ from that of the industry. When estimating an industry median beta, exclude outliers from the sample if there are plausible reasons that they should have betas different from the rest of the sample.

ESTIMATING CONTINUING VALUE

We use the value driver model to estimate Heineken's DCF continuing value. For the business-as-usual scenario, the values of the parameters are estimated as follows:

- The first year of the continuing-value period is 2029 (one year after the last forecast year). We project Heineken's 2029 NOPLAT to be €3,809 million.
- Heineken's WACC is projected to remain at 8.3 percent. We do not foresee any significant change in Heineken's target capital structure or business risk.
- Heineken's return on new invested capital (RONIC) before goodwill beyond 2024 is forecast to be 25 percent. This is close to the forecast performance in the years leading up to 2029 in this scenario. It implies that Heineken, like other branded consumer product companies, owns brands that will allow it to achieve returns above its cost of capital for a long time.
- We expect that Heineken's NOPLAT will grow at 3.5 percent in perpetuity.

By using these parameters in the recommended continuing-value formula, we obtain an estimated continuing value (CV) of €68,252 million in 2029:

$$
\begin{aligned}
\text{CV} &= \frac{\text{NOPLAT}_{2029}\left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g} \\
&= \frac{3,809 \text{ million}\left(1 - \dfrac{3.5\%}{25\%}\right)}{8.3\% - 3.5\%} \\
&= 68,252 \text{ million}
\end{aligned}
$$

Using the economic-profit approach and the same parameters, we obtain a continuing value of economic profit after 2028 equal to €53,846 million, calculated as follows:

$$
\begin{aligned}
\text{CV of Economic Profit} &= \frac{\text{Economic Profit}_{2029}}{\text{WACC}} \\
&\quad + \frac{\text{NOPLAT}_{2029}\left(\dfrac{g}{\text{RONIC}}\right)(\text{RONIC} - \text{WACC})}{\text{WACC}(\text{WACC} - g)} \\
&= \frac{2,614 \text{ million}}{8.3\%} + \frac{3,809 \text{ million}\left(\dfrac{3.5\%}{25\%}\right)(25\% - 8.3\%)}{8.3\%(8.3\% - 3.5\%)} \\
&= 53,846 \text{ million}
\end{aligned}
$$

The discounted continuing value is about half of Heineken's value, because Heineken is expected to earn more than its cost of capital during and after the explicit forecast. Note that the economic-profit continuing value is smaller than the DCF continuing value. Adding the amount of invested capital at the end of 2028 to the continuing value of economic profit would give a total continuing value of €68,252 million, the same value calculated using the DCF approach:

$$\begin{aligned}\text{CV} &= \text{Invested Capital}_{2028} + \text{CV of Economic Profit}\\ &= 14,406\ \text{million} + 53,846\ \text{million}\\ &= 68,252\ \text{million}\end{aligned}$$

CALCULATING AND INTERPRETING RESULTS

To complete and analyze the Heineken valuation, we first calculate the equity value of Heineken for the business-as-usual scenario. We then value the other two scenarios we developed. Finally, we estimate a probability-weighted value.

Value in the Business-as-Usual Scenario

Exhibits 24.31 and 24.32 show the calculation of the value of Heineken's operations as of January 2014, using the DCF and economic-profit approaches, respectively. Under both methods, the value of Heineken's operations is €42.3 billion.

EXHIBIT 24.31 **Heineken: DCF Valuation**

€ million

	Free cash flow	Discount factor	Present value of FCF
2014	1,895	0.9234	1,749
2015	1,970	0.8526	1,680
2016	2,049	0.7873	1,613
2017	2,131	0.7269	1,549
2018	2,216	0.6712	1,488
2019	2,343	0.6198	1,452
2020	2,425	0.5723	1,388
2021	2,510	0.5284	1,326
2022	2,598	0.4879	1,268
2023	2,689	0.4505	1,211
2024	2,783	0.4160	1,158
2025	2,880	0.3841	1,106
2026	2,981	0.3547	1,057
2027	3,085	0.3275	1,010
2028	3,193	0.3024	966
Continuing value	68,252	0.3024	20,639
Value of operations			40,661
Midyear adjustment factor			1.04
Operating value (as of January 1, 2014)			42,315

EXHIBIT 24.32 **Heineken: Economic-Profit Valuation**

€ million

	Economic profit (EP)	Discount factor	Present value of EP
2014	1,534	0.9234	1,416
2015	1,595	0.8526	1,360
2016	1,659	0.7873	1,306
2017	1,725	0.7269	1,254
2018	1,794	0.6712	1,204
2019	1,853	0.6198	1,148
2020	1,918	0.5723	1,097
2021	1,985	0.5284	1,049
2022	2,054	0.4879	1,002
2023	2,126	0.4505	958
2024	2,201	0.4160	915
2025	2,278	0.3841	875
2026	2,357	0.3547	836
2027	2,440	0.3275	799
2028	2,525	0.3024	764
Continuing value	53,846	0.3024	16,283
Present value of economic profit			32,267
Invested capital without goodwill (as of January 1, 2014)			8,394
Less: Present value of investments in goodwill			0
Value of operations			40,661
Midyear adjustment factor			1.04
Operating value (as of January 1, 2014)			42,315

The value of operations includes a midyear adjustment equal to one-half of a year's value discounted at Heineken's WACC. This is to adjust for the fact that we conservatively discounted the free cash flows and economic profits as if they were entirely realized at the end of each year when, in fact, cash flows occur (cycles notwithstanding) evenly throughout the year. The six-month factor assumes that cash flows will come in on average in the middle of the year.

Under the business-as-usual scenario, Heineken's equity value is €29.1 billion, or €51 per share, as shown in Exhibit 24.33. To calculate the market equity value, we first add the market value of the following assets to the value of operations to obtain the enterprise value:

- Heineken's excess cash of €906 million is estimated at book value.
- Nonconsolidated investments are equity holdings in companies where Heineken does not have economic control. Heineken's share of income from these companies was €146 million in 2013, which we multiply by a typical brewer's P/E multiple of 15 to estimate the value of Heineken's interest at €2,207 million.

EXHIBIT 24.33 **Heineken: Value of Equity**

€ million

	Book value	Market value
Value of operations		42,315
Excess cash	906	906
Nonconsolidated investments	1,883	2,207
Other financial assets	583	583
Tax loss carryforwards	220	220
Enterprise value		**46,231**
Short-term debt[1]	(2,561)	(2,561)
Long-term debt	(9,853)	(9,853)
Postretirement benefit liabilities, net of assets	(1,202)	(900)
Other nonoperating provisions	(538)	(404)
Value of outstanding options	–	–
Noncontrolling interests	(954)	(3,372)
Equity value		**29,142**
Number of shares outstanding, million[2]		575
Value per share		**€51**

[1] Includes interest payable.
[2] Less treasury shares.

- Other financial assets of €583 million are primarily receivables from customers, available-for-sale investments, and investments held to maturity. We estimate these at book value.
- Tax loss carryforwards are estimated at book value of €220 million. To value these assets more accurately, we would need information on the applicable tax rates and future taxable profits for the businesses that the tax loss carryforwards apply to.

In this way, we determine an enterprise value of €46.2 billion. We then subtract debt, postretirement liabilities, noncontrolling interests, and nonoperating provisions to obtain the equity value. The values of these liabilities were estimated in the section on cost of capital earlier in the chapter.

Additional Scenarios and Probability Weighting

Following a similar process as detailed here, we also valued the other two scenarios for Heineken: the business-improvement scenario and the aggressive-acquisition scenario. The results are summarized in Exhibit 24.34.

In the business-improvement scenario, we project that Heineken rigorously improves margins and capital turnover. It will bridge approximately half of the existing gap in margin with SABMiller, its nearest-size competitor, by 2018. This brings Heineken's ROIC up to 31 percent on average over the years leading up to 2018, versus 26 percent in the business-as-usual scenario. Under

EXHIBIT 24.34 **Summary of Scenario Values**

€ million

	Scenario		
	Operating improvement	**Business as usual**	**Aggressive acquisition**
Average revenue growth, 2014–2018, %	4.0	4.0	14.0
Average EBITA/revenues, 2014–2018, %	18.6	15.5	16.2
Average ROIC excluding goodwill, 2014–2018,[1] %	31.3	26.1	28.5
Average ROIC including goodwill, 2014–2018,[1] %	10.5	8.7	7.7
Enterprise value, € billion	57.1	42.3	41.1
Equity value, € billion	43.9	29.1	27.9
Equity value per share, €	76	51	49
Probability, %	15	70	15
Expected value per share, €		**54**	

[1] Based on average invested capital.

the business-improvement scenario, Heineken's value is around €76 per share, a hefty 50 percent premium to the business-as-usual scenario.

For the aggressive-acquisition scenario, we forecast annual growth from acquisitions at 10 percent from 2014 to 2018. Under this scenario, competition for acquisitions heats up, and Heineken is forced to pay high premiums to continue its acquisition growth. We forecast goodwill at around 250 percent of revenues from acquisitions during the acquisition year. Operating performance improves as a result of cost synergies, gradually increasing EBITA margin by two percentage points by 2018. Under the aggressive-acquisition scenario, Heineken's value is €49 per share, just below the €51 per share for the business-as-usual case.

Finally, we weight the scenario values with probabilities and arrive at an estimated value of €54 per share, as shown in Exhibit 24.34.[6] We believe that Heineken will continue to focus on operating improvement, especially in the light of the margins delivered by AB InBev and SABMiller. However, as recent years have shown, significant operating improvements have been difficult to achieve. As for the aggressive-acquisition scenario, we do believe there is still considerable room for consolidation in the world's beer industry, but Heineken has not engaged in many large-scale acquisitions, having generated around 6 percent revenue growth from acquisitions over the last years. Lifting that growth to 10 percent year-on-year is a possible but unlikely scenario.

The real insight from the scenario approach is the spread of values. Note how a scenario in which Heineken closes half of the performance gap with SABMiller would provide a 50 percent upside to its current value. This shows

[6] In 2014, Heineken's share price increased from around €45 in January to around €63 in December.

how important it is in this industry to continue to drive for improvements in operating performance. In contrast, acquisitions at increasing premiums over book value could be value destroying—unless cost synergies were higher than we assumed. As a result, even in the case of a profitable but modestly growing company like Heineken, the spread of values per share from €76 to €49 across the scenarios indicates a substantial opportunity (or risk) for both investors and managers.

Part Four

Managing for Value

25

Corporate Portfolio Strategy

Part Four, beginning with this chapter, looks at value creation from a management perspective. Deciding what businesses to be in is clearly one of the most important decisions executives make. In fact, to a large extent, the businesses a company is in determine its destiny. For example, a company that produces commodity chemicals is unlikely ever to earn as much return on capital as a branded breakfast cereal company can.

That said, different owners and managers might be able to extract more or less value from the same business. So, in addition to picking attractive businesses, a guiding principle for portfolio decisions is that the owner able to generate the greatest cash flows from a business is the owner that will create the most value.

The importance of picking the right business is pointed out by Kaplan, Sensoy, and Strömberg. They use the analogy of whether to bet on the horse or the jockey.[1] They analyzed small start-up companies financed by venture capital firms, tracking whether the start-ups eventually grew large and successful enough to go public. They found that it was better to have a competitive advantage (horse) than to have a good management team (jockey). With a competitive advantage, the venture capitalists could always replace a weak management team. But even the best management team might not be able to salvage a weak business. In other words, bet on the horse, not the jockey. Warren Buffett made the same point in his own unique way: "When a management team with a reputation for brilliance joins a business with poor fundamental economics, it is the reputation of the business that remains intact."

[1] S. N. Kaplan, B. A. Sensoy, and P. Strömberg, "Should Investors Bet on the Jockey or the Horse? Evidence from the Evolution of Firms from Early Business Plans to Public Companies," *Journal of Finance* 64, no. 1 (February 2009): 75–115.

Although the best management team may not be able to salvage a poor or declining business, different owners or management teams may extract higher levels of performance from a given business and therefore serve as better owners. General Mills' purchase of Pillsbury from Diageo in 2001 illustrates the point. Shortly after buying Pillsbury for $10.4 billion, General Mills increased the business's pretax cash flows by more than $400 million per year, increasing Pillsbury's operating profits by roughly 70 percent. Diageo's core business is in alcoholic beverages, while General Mills and Pillsbury sell packaged foods. Under Diageo, Pillsbury was run entirely separately from Diageo's core business, because the two companies' manufacturing, distribution, and marketing operations rarely overlapped. In contrast, General Mills substantially reduced costs in Pillsbury's purchasing, manufacturing, and distribution, because the two companies' operations duplicated significant costs. On the revenue side, General Mills boosted Pillsbury's revenues by introducing Pillsbury products to schools in the United States where General Mills already had a strong presence. And the synergies worked both ways: for instance, Pillsbury's refrigerated trucks were used to distribute General Mills' new line of refrigerated meals.

Pillsbury represented value in at least two ways at the time of the sale: its value to General Mills and its value to Diageo. For General Mills to consider the deal attractive, Pillsbury's worth under General Mills' ownership had to be greater than the $10.4 billion purchase price. For Diageo to consider the deal attractive, General Mills' offer had to represent more than the value Diageo expected to create from Pillsbury in the future.

Clearly, from a value-creating perspective, General Mills was a better owner of Pillsbury than Diageo. In reality, one can never pinpoint a company's ideal owner, but can only identify the best among potential owners in any given circumstances. In theory, some company other than General Mills could have generated even higher cash flows as Pillsbury's owner. But this example illustrates how much impact a different owner can make to a company's value: 70 percent in this case. Best ownership also helps the economy by redirecting resources to their highest-value use. Significant activities can be carried out at much lower cost, freeing up capital and human resources for other activities.

This chapter explains what makes the best owner for a company and how the corporations that qualify as best owner may change over time. It also discusses how a business portfolio evolves and how to construct a portfolio. Finally, it dispels some myths about diversification.

WHAT MAKES AN OWNER THE BEST

To identify the best owner of a business in any given industry circumstances, you first have to understand the sources of value on which potential new owners might draw. Some owners add value by linking a new business with other activities in their portfolio—for example, by using existing sales channels to access additional customers, or by sharing an existing manufacturing infrastructure. Others add value through distinctive skills such as operational or marketing excellence, or by providing better governance and incentives for the management team, or by having better insight into how a market will develop. Still others add value by more effectively influencing a particular market's critical stakeholders—for instance, governments, regulators, or customers. Let's examine these sources of value one at a time, understanding that in some cases the best owner may be able to draw on two or more sources at once.

Unique Links with Other Businesses

The most direct way that owners add value is by creating links between businesses within their portfolio, especially when only the parent company can make such links. Suppose a mining company has the rights to develop a coalfield in a remote location far from any rail lines or other infrastructure. Another mining company already operates a coal mine just 10 miles away and has built the necessary infrastructure, including the rail line. The second mining company would be a better owner of the new mine because its incremental costs to develop the mine are much lower than anyone else's. It can afford to purchase the undeveloped mine at a higher price than any other firm in the market and still earn an attractive return on invested capital (ROIC).

Such unique links can be made across the value chain, from research and development (R&D) to manufacturing to distribution to sales. For instance, a large pharmaceutical company with a sales force dedicated to oncology might be the best owner of a small pharmaceutical company with a promising new oncology drug but no sales force.

Distinctive Skills

Better owners may have distinctive functional or managerial skills from which the new business can benefit. Such skills may reside anywhere in the business system, including product development, manufacturing processes, and sales and marketing. But to make a difference, any such skill has to be a key driver of success in the industry. For example, a company with great manufacturing skills probably wouldn't be a better owner of a consumer packaged-goods business, because the latter company's manufacturing costs aren't large enough to affect its competitive position.

In consumer packaged goods, distinctive skills in developing and marketing brands are more likely to make one company a better owner than another. Take Procter & Gamble (P&G), which in 2013 had 23 billion-dollar brands in terms of net sales and 14 half-billion-dollar brands spread across a range of product categories, including laundry detergent, beauty products, pet food, and diapers. Almost all of P&G's billion-dollar brands rank first or second in their respective markets. What makes P&G special is that it developed these brands in different ways. Some, including Tide and Crest, have been P&G brands for decades. Others, including Gillette and Oral-B, were acquired in the past 10 years. Finally, Febreze and Swiffer were developed from scratch in the past 15 years. In 2014, P&G continued to refine its business model, realizing that its distinctive skills were best applied to very large brands. It announced that it would discontinue or divest 90 to 100 of its 180 brands, focusing its energy on the remaining brands.

Another example of distinctive skills is Danaher, a diversified company with revenues of $19 billion. What makes Danaher successful is its well-known Danaher Business System. Danaher makes acquisitions only where it believes it can apply its management approach to substantially improve margins. By applying this strategy over the past 20 years, Danaher has consistently increased the margins of its acquired companies. These include Gilbarco Veeder-Root, a leader in point-of-sale solutions, and Videojet Technologies, which manufactures coding and marking equipment and software. Both companies' margins improved by more than 700 basis points after Danaher acquired them.

Better Governance

Better owners can also add value through their better overall governance of a business, without necessarily running its day-to-day operations. Better governance refers to the way the company's owners (or their representatives) interact with the management team to create maximum value in the long term. For example, the best private-equity firms don't just recapitalize companies with debt; they improve the companies' performance through improved governance.

Two of our colleagues analyzed 60 successful investments by 11 leading private-equity firms. They found that in almost two-thirds of the transactions, the primary source of new value was improvement in the operating performance of the company, relative to peers, through fruitful interaction between the owners and the management team.[2] The use of financial leverage and clever timing of investments, often cited as private-equity firms' most important sources of success, were not as important as improved governance.

Private-equity firms don't have the time or skills to run their portfolio companies from day to day, but the higher-performing private-equity firms do govern these companies very differently from the way exchange-listed companies are governed. This is a key source of their outperformance. Typically, the private-equity firms introduce a stronger performance culture and make quick management changes when necessary. They encourage managers to abandon

[2] C. Kehoe and J. Heel, "Why Some Private Equity Firms Do Better," *McKinsey Quarterly*, no. 1 (2005): 24–26.

any sacred cows, and they give managers leeway to focus on a longer horizon, say five years, rather than the typical one-year horizon for a listed company. Moreover, the boards of private-equity companies spend three times as many days on their roles as do those at public companies. Private-equity firms spend most of their time on strategy and performance management, rather than compliance and risk avoidance, where boards of public companies typically focus.[3]

Better Insight and Foresight

Companies that act on their insight into how a market and industry will evolve to expand existing businesses or develop new ones can be better owners because they capitalize on innovative ideas. One example is Intuit, which noticed in the late 1990s that many small businesses were using its Quicken software, originally designed to help consumers manage personal finances. The observation led to an important insight: most business accounting software was too complex for the small-business owner. So Intuit designed a new product expressly for small-business accounting. Within two years, it had claimed 80 percent of this burgeoning market.

Another example is Alibaba, China's leading online marketplace. Its leaders realized that lack of trust between buyers and sellers was a barrier to the growth of online marketplaces in China. So in 2004, five years after Alibaba's founding, the company launched Alipay, an escrow service to facilitate online transactions. A buyer deposits money with Alipay for the purchase of goods. Once the goods are shipped and are found acceptable, Alipay releases the funds to the seller. Alipay provides services not only to Alibaba's online businesses but also to thousands of other merchants. In 2011, Alipay was spun off into a stand-alone company.

Distinctive Access to Critical Stakeholders

Distinctive access to talent, capital, government, suppliers, and customers primarily benefits companies in emerging markets. Several factors complicate running companies in emerging markets: relatively small pools of managerial talent from which to hire, undeveloped capital markets, and governments that are heavily involved in business as customers, suppliers, and regulators.

In such markets, large-scale diversified conglomerates, such as Tata and Reliance in India and Samsung and Hyundai in South Korea, can be better owners of many businesses because they are more attractive employers, allowing them to skim off the best talent. With regard to capital, many emerging countries still need to build up their infrastructures; such projects typically require large amounts of capital that smaller companies can't raise. Companies also

[3]V. Acharya, C. Kehoe, and M. Reyner, "The Voice of Experience: Public versus Private Equity," *McKinsey on Finance,* (Spring 2009): 16-20.

often need government approval to purchase land and to build factories, as well as government assurances that there will be sufficient infrastructure to get products to and from factories and sufficient electricity to keep them operating. Large conglomerates typically have the resources and relationships needed to navigate the maze of government regulations and to ensure relatively smooth operations.

In more developed markets, access to talent and capital are rarely an issue. In fact, in the United States, smaller, high-growth companies are often more attractive to talent than larger companies. Moreover, capital is readily available in these markets, even for small businesses. Finally, with some exceptions, clout with the government rarely provides an advantage, given the arm's-length government procurement processes more common in these countries.

THE BEST-OWNER LIFE CYCLE

The definition of *best owner* isn't static, and best owners themselves will change over time as a business's circumstances change. Thus, a business's best owner could at different times be a larger company, a private-equity firm, a government, a sovereign wealth fund, a family, the business's customers, its employees, or shareholders whenever a business becomes an independent public company listed on a stock exchange.

Furthermore, the parties vying to become best owners are continually evolving in different ways in different parts of the world. In the United States, most large companies are either listed or owned by private-equity funds. They tend to go public earlier than companies elsewhere, so they rarely involve the second generation of a founding family. In Europe, government ownership also plays an important role. In Asia and South America, large companies are often controlled for several generations by members of their founding families, and family relationships also create ownership links between different businesses. Capital markets in these regions aren't as well developed, so founders are more concerned about ensuring that their firms stay true to their legacy after they have retired.

Consider an example of how the best owner for a company might change with its circumstances. Naturally, a business's founders will almost always be its first best owners. The founders' entrepreneurial drive, passion, and tangible commitment to the business are essential to getting the company off the ground.

As a business grows, it will probably need more capital, so it may sell a stake to a venture capital fund that specializes in helping new companies to grow. At this point, it's not unusual for the fund to put in new managers who supplant or supplement the founders, bringing skills and experience better suited to managing the complexities and risks of a larger organization.

To provide even more capital, the venture capital firm may take the company public, selling shares to a range of investors and, in the process, enabling itself, the founders, and the managers to realize the value of the company they created. When the company goes public, control shifts to an independent board of directors (though the founders will still have important influence if they continue to own substantial stakes).

As the industry evolves, the company might find that it cannot compete with larger companies because, for instance, it needs distribution capability far beyond what it can build by itself in a reasonable time to challenge global competitors. Other external factors, such as regulatory or technological changes, also can create a need to change owners. In response to this limitation, the company may sell itself to a larger company that has the needed capability. In this way, it becomes a product line or business within a division of a multibusiness corporation. Now the original company will merge with the manufacturing, sales, distribution, and administrative functions of the division.

As the markets mature for the businesses in the division where the original company now operates, its corporate owner may decide to focus on other, faster-growing businesses. So the corporation may sell its division to a private-equity firm. Now that the division stands alone, the private-equity firm can see how it has amassed an amount of central overhead that is far higher than is needed for a slow-growth market. So the private-equity firm restructures the division to give it a leaner cost structure. Once the restructuring is done, the private-equity firm sells the division to a large company that specializes in running slow-growth brands.

At each stage of the company's life, each best owner took actions to increase the company's cash flows, thereby adding value. The founder came up with the idea for the business. The venture capital firm provided capital and professional management. Going public provided the early investors with a way to realize the value of the founders' groundwork and raised more cash. The large corporation accelerated the company's growth with a global distribution capability. The private-equity firm restructured the company's division when growth slowed. The company that became the final best owner applied its skills in managing slow-growth brands. All these changes of ownership made sense in terms of creating value.

DYNAMIC PORTFOLIO MANAGEMENT

Applying the best-owner sequence, executives must continually identify and develop or acquire companies where they could be the best owner, and must divest businesses where they used to be the best owner but now have less to contribute than another potential owner. Since the best owner for a given business changes with time, a company needs to have a structured, regular corporate strategy process to review and renew its list of development ideas and acquisition targets, and to test whether any of its existing businesses have reached their sell-by date. Similarly, as demand falls off in a mature industry, long-standing companies are likely to have excess capacity. If they don't have the will or ability to shrink assets and people along with capacity, then they're not the best owner of the business anymore. At any time in a business's history, one group of managers may be better equipped to manage the business than another. At moments like these, acquisitions and divestitures are often the best or only way to allocate resources sensibly.

A McKinsey study of 200 large U.S. companies over a 10-year period showed that companies with a passive portfolio approach—those that didn't sell businesses or only sold poor businesses under pressure—underperformed companies with an active portfolio approach.[4] The best performers systematically divested and acquired companies. The process is natural and never ends. A divested unit may very well pursue further separations later in its lifetime, especially in dynamic industries undergoing rapid growth and technological change.

General Dynamics, the U.S. defense company, provides an interesting example of an active portfolio approach that created considerable value. At the beginning of the 1990s, General Dynamics faced an unattractive industry environment. According to forecasts at that time, U.S. defense spending would decline significantly, and this was expected to hurt General Dynamics, since it was a supplier of weapons systems. When CEO William A. Anders took control in 1991, he initiated a series of divestitures. Revenues were halved in a period of two years, but shareholder returns were extraordinary: an annualized rate of 58 percent between 1991 and 1995, more than double the shareholder returns of General Dynamics' major peers. Then, starting in 1995, Anders began acquiring companies in attractive subsectors. Over the next seven years, General Dynamics' annualized return exceeded 20 percent, again more than double the typical returns in the sector.

For acquisitions, applying the best-owner principle often leads potential acquirers toward targets that are very different from those produced by traditional screening approaches. Traditional approaches often focus on finding potential targets that perform well financially and are somehow related to the parent's business lines. But through the best-owner lens, such characteristics might be less important or irrelevant.

Potential acquirers might do better to seek a financially weak company that has great potential for improvement, especially if the acquirer has proven expertise in improving performance. Focusing attention on tangible opportunities to reduce costs or on identifying common customers may be more rewarding in the long run than investigating a target for the vague reason that it is somehow related to your company.

[4] J. Brandimarte, W. Fallon, and R. McNish, "Trading the Corporate Portfolio," *McKinsey on Finance* (Fall 2001): 1–5.

Companies following the best-owner philosophy are as active in divesting as they are in acquiring; they sell and spin off companies regularly and for good reasons. To illustrate, 50 years ago many pharmaceutical and chemical companies were combined because they required similar manufacturing processes and skills. But as the two industries matured, their research, manufacturing, and other skills diverged considerably, to the extent that they became distant cousins rather than sister companies.

Today the keys to running a commodity chemicals company are scale, operating efficiency, and management of costs and capital expenditures. In contrast, the keys to running a pharmaceutical company are managing an R&D pipeline, a sophisticated sales force, the regulatory approval process, and relations with government in state-run health systems that buy prescription drugs. So while it might once have made sense for the two types of business to share a common owner, it no longer does. This is why nearly all formerly combined chemical-pharmaceutical companies have split up. For instance, the pharmaceutical company Zeneca was split from Imperial Chemical Industries in 1993 and later merged with another pharmaceutical company to form AstraZeneca. Similarly, pharmaceutical company Aventis was split off from the chemical company Hoechst in 1999; it was later purchased by Sanofi Synthelabo to create Sanofi Aventis, forming a bigger pharma-only company.

Executives are often concerned that divestitures look like an admission of failure, will make their company smaller, and will reduce their stock market value. Yet the research shows that, on the contrary, the stock market consistently reacts positively to divestitures, both sales and spin-offs.[5] Research has also shown that spun-off businesses tend to increase their profit margins by one-third during the three years after the transactions are complete.[6] Thus, planned divestitures are a sign of successful value creation.

In recent years, a number of prominent companies have decided that shrinking is a good thing. Notably, P&G not only would discontinue or divest 90 to 100 small brands, but in 2014 also announced that it would sell its pet food businesses and spin off its Duracell battery business. This kind of thoughtful shrinking allows disparate businesses to focus on their unique needs and competitive situations.

In another example of purposely shrinking, Kraft in 2012 split into two businesses: Mondelez International and Kraft Foods Group. Mondelez is a global snack food business selling cookies, crackers, and chocolate. Kraft is a North American–only grocery products company, focusing on cheese, meat products, sauces, and coffee. Although both companies are in branded foods,

[5]J. Mulherin and A. Boone, "Comparing Acquisitions and Divestitures," *Journal of Corporate Finance* 6 (2000): 117–139.

[6]P. Cusatis, J. Miles, and J. Woolridge, "Some New Evidence That Spinoffs Create Value," *Journal of Applied Corporate Finance* 7 (1994): 100–107.

management believed that the challenges and opportunities of the two businesses were different enough that they would be better managed as separate companies.

THE MYTH OF DIVERSIFICATION

A perennial question in corporate strategy is whether companies should hold a diversified portfolio of businesses. The idea seemed to be discredited in the 1970s, yet some executives still say things like “It’s the third leg of the stool that makes a company stable.” Our perspective is that diversification is intrinsically neither good nor bad; which it is depends on whether the parent company adds more value to the businesses it owns than any other potential owner could, making it the best owner of those businesses in the circumstances.

Over the years, different ideas have been floated to encourage or justify diversification, but these theories simply don’t hold water. Most rest on the idea that different businesses have different business cycles, so cash flows at the peak of one business’s cycle will offset the lean cash years of other businesses, thereby stabilizing a company’s consolidated cash flows. If cash flows and earnings are smoothed in this way, the reasoning goes, then investors will pay higher prices for the company’s stock.

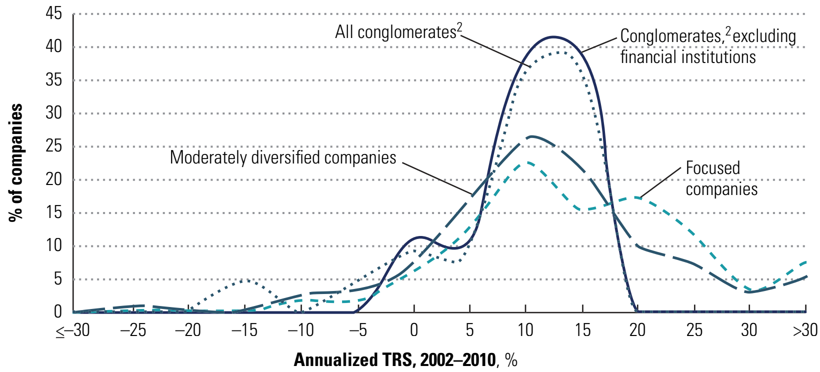
The facts refute this argument. First, we haven’t found any evidence that diversified companies actually generate smoother cash flows. We examined the 50 companies from the Standard & Poor’s (S&P) 500 index with the lowest earnings volatility from 1997 to 2007. Fewer than 10 could be considered diversified companies, in the sense of owning businesses in more than two distinct industries. Second, and just as important, there is no evidence that investors pay higher prices for less volatile companies (see Chapter 5). In our regular analyses of diversified companies for our clients, we almost never find that the value of the sum of a diversified company’s business units is substantially different from the market value of the consolidated company.

Another argument is that diversified companies with more stable cash flows can safely take on more debt, thus getting a larger tax benefit from debt. While this may make sense in theory, however, we’ve never come across diversified companies that systematically used more debt than their peers.

Finally, a more nuanced argument is that diversified companies are better positioned to take advantage of different business cycles in different sectors. They can use cash flows from their businesses in sectors at the top of their cycle to invest in businesses in sectors at the bottom of their cycle (when their undiversified competitors cannot). Once again, we haven’t found diversified companies that actually behave that way. In fact, we typically find the opposite: the senior executives at diversified companies don’t understand their individual business units well enough to have the confidence to invest at the bottom of

EXHIBIT 25.1 **Distribution of TRS by Levels of Diversification**

Distribution of S&P 500 companies by total returns to shareholders (TRS), $n = 461$[1]



[1] Includes companies in 2010 S&P 500 that were also publicly listed on December 31, 2002.
[2] Defined as any company with three or more business units that do not have common customers, distribution systems, manufacturing facilities, or technologies.

the cycle, when none of the competitors are investing. Diversified companies tend to respond to opportunities more slowly than less diversified companies.

While any benefits from diversification are elusive, the costs are very real. Investors can diversify their investment portfolios at lower cost than companies can diversify their business portfolios, because they only have to buy and sell stocks, something they can do easily and relatively cheaply many times a year. In contrast, substantially changing the shape of a portfolio of real businesses involves a diversified company in considerable transaction costs and disruption, and it typically takes many years. Moreover, the business units of diversified companies often perform less well than those of more focused peers, partly because of added complexity and bureaucracy.

Today, many executives and boards in developed markets realize how difficult it is to add value to businesses that aren't connected to each other in some way. As a result, many pairings have largely disappeared. In the United States, for example, by the end of 2010, there were only 22 true conglomerates.[7] Since then, three have announced that they would split up, too.

We examined the performance of these conglomerates versus focused companies. The striking insight was not that average total returns to shareholders (TRS) was lower for conglomerates, but that the top end of the distribution was chopped off (see Exhibit 25.1). Upside gains are limited because it's unlikely that all of a diverse conglomerate's businesses will outperform at the

[7] J. Cyriac, T. Koller, and J. Thomsen, "Testing the Limits of Diversification," *McKinsey Quarterly* (February 2012). Conglomerates were defined as a company with three or more business units that do not have common customers, distribution systems, technologies, or manufacturing facilities.

same time. The returns of units that do are dwarfed by underperformers. Moreover, conglomerates are usually made up of relatively mature businesses, well beyond the point where they would be likely to generate unexpected returns. But the downside isn't limited, because the performance of more mature businesses can fall a lot further than it can rise. Consider a simple mathematical example: if a business unit accounting for a third of a conglomerate's value earns a 20 percent TRS while other units earn 10 percent, the weighted average will be about 14 percent. But if that unit's TRS is –50 percent, the weighted average TRS will be dragged down to about 2 percent, even before other units are affected. In addition, the poor aggregate performance can affect the motivation of the entire company and the company's reputation with customers, suppliers, and prospective employees.

What matters in a diversification strategy is whether managers have the skills to add value to businesses in unrelated industries. We found three ways high-performing conglomerates outperform. First, as discussed in greater depth in Chapter 27, "Mergers and Acquisitions," high-performing conglomerates continually rebalance their portfolios by purchasing companies whose performance they can improve.

Second, high-performing conglomerates aggressively manage capital allocation across units at the corporate level. All cash that exceeds what's needed for operating requirements is transferred to the parent company, which decides how to allocate it across current and new business or investment opportunities, based on their potential for growth and returns on invested capital. Berkshire Hathaway's business units, for example, are rationalized from a capital standpoint: excess capital is sent where it is most productive, and all investments pay for the capital they use.

Finally, high-performing conglomerates operate much as better private-equity firms do: with a lean corporate center that restricts its involvement in the management of business units to selecting leaders, allocating capital, vetting strategy, setting performance targets, and monitoring performance. Just as important, these firms do not create extensive corporate-wide processes or large shared-service centers. (You won't find corporate-wide programs to reduce working capital, say, because that may not be a priority for all parts of the company.) Business units at Illinois Tool Works, for example, are primarily self-supporting, with broad authority to manage themselves as long as managers adhere to the company's 80/20 (80 percent of a company's revenue is derived from 20 percent of its customers) and innovation principles. The corporate center largely handles taxes, auditing, investor relations, and some centralized human resources functions.

As mentioned earlier, the economic situation in emerging markets is distinct enough that we are cautious in applying insights gleaned from developed-world companies. Some preliminary, unpublished McKinsey research, for example, shows that more diversified companies in emerging markets outperform their less diversified peers. That is not the case in developed markets.

While we expect the conglomerate structure to fade away eventually, the pace will vary from country to country and industry to industry.

We can already see the rough contours of change in the role that conglomerates play in emerging markets. Infrastructure and other capital-intensive businesses are likely to be parts of large conglomerates as long as access to capital and connections is important. In contrast, companies that rely less on access to capital and connections tend to be focused on, rather than part of, large conglomerates. These companies include export-oriented ones such as those in information technology (IT) services and pharmaceuticals.

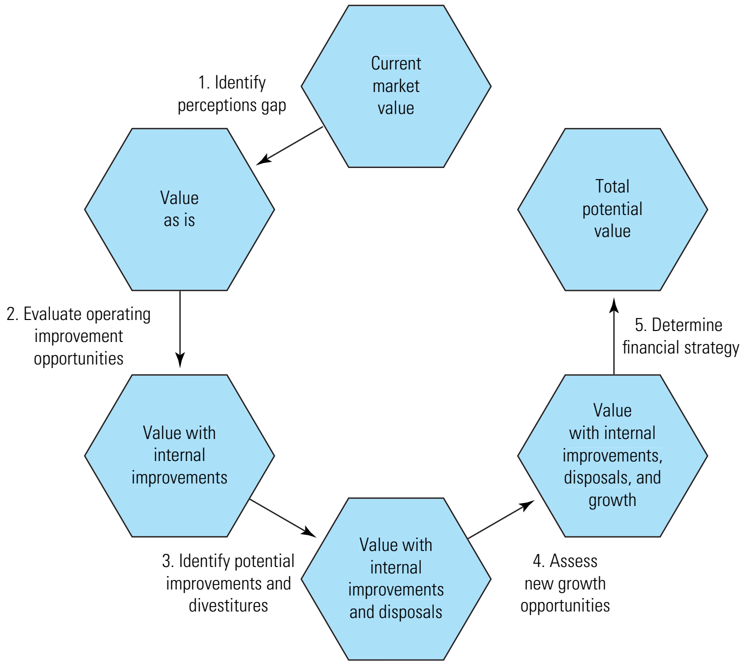
The rise of IT services and pharmaceuticals in India and of Internet companies in China shows that the large conglomerates' edge in access to managerial talent has already fallen. As emerging markets open to more foreign investors, these companies' advantage in access to capital will also decline. That will leave access to government as their last remaining strength, further restricting their opportunities to industries where its influence remains important. Although the time could be decades away, conglomerates' large size and diversification will eventually become impediments rather than advantages.

CONSTRUCTING THE PORTFOLIO

Executives can apply the principles discussed in this chapter to construct a portfolio of businesses for their company. A typical large company already owns enterprises in a single business or has an existing collection of diverse businesses. So a logical starting place for constructing a more valuable portfolio would be to clean up the company's current portfolio. While there's no single right way to think through this task, we've found over the past 20 years that a systematic approach to constructing a company's portfolio of businesses is helpful. This section describes that approach, which is illustrated in Exhibit 25.2, as five analytical steps a company should pursue to develop its portfolio of businesses. Each step lands at a higher-level value, moving from current market value to total potential value:

1. Identify a *perceptions gap.* Determine the company's current market value, and compare it with the company's value as is: its discounted-cash-flow (DCF) value estimated from cash-flow projections based on existing business plans. Any gap implies that the company's managers have a different perspective on the value of the businesses than investors have.
2. Evaluate *operating improvements.* Identify and value opportunities to improve operations internally—for example, by increasing margins, accelerating core revenue growth, and improving capital efficiency.

EXHIBIT 25.2 **Steps in Constructing a Portfolio of Businesses**



3. Identify *businesses for disposal and new owners.* Evaluate whether divesting certain businesses would increase the company's value.
4. Assess *new growth opportunities.* Identify potential acquisitions or other initiatives to create new growth. Estimate their impact on value.
5. Determine *financial strategy.* Estimate how the company's value might be increased through changes in its capital structure or other financial-strategy changes.

Adding these increases to the current market value gives the total potential value of the company.

As an example, consider how the corporate-strategy team at a real company (we'll call it EG Corporation) applied this approach. EG Corporation is a $10.65 billion company with six operating businesses, described in Exhibit 25.3. Consumerco, which manufactures and markets branded consumer packaged goods, was earning a high return on invested capital (ROIC), but its growth had barely kept up with inflation. Nevertheless, because of its size and high ROIC, it accounted for about 72 percent of EG's total enterprise value. Foodco operates a contract food service business. Its earnings had been growing, but ROIC was low because of high capital-investment requirements in facilities. Woodco, a midsize furniture manufacturer, was formed through the acquisition of eight

EXHIBIT 25.3 **EG Corporation: Current Situation**

	Sales, $ million	**EBITA**, $ million	**Revenue growth**, %	**ROIC**, %	**DCF value of business plans**, $ million
Consumerco	6,300	435	3	30	6,345
Foodco	1,500	120	15	9	825
Woodco	2,550	75	19	6	1,800
Newsco	300	45	6	20	600
Propco	–	15	–	–	450
Finco	–	9	–	–	105
Corporate overhead	–	–	–	–	(1,275)
Total	10,650	699			8,850
Debt					(900)
Equity value					7,950
Less: Stock market value					7,200
Value gap					750
% of stock market value					10

smaller companies, but their operations were still being consolidated. Woodco had suffered steadily declining returns. The other three businesses in the portfolio are a small newspaper, a small property development company, and a small consumer finance company.

As shown in Exhibit 25.3, the discounted-cash-flow (DCF) value of EG based on its business plans approximately matched its market value. A cash flow analysis showed that, while EG had been generating substantial discretionary (or free) cash flow in the Consumerco business, a large portion of that money had been sunk into Woodco and Foodco, and relatively little was reinvested in Consumerco. Moreover, little of the cash had found its way back to EG's shareholders. Over the previous five years, EG had, in effect, been borrowing to pay dividends to its shareholders.

The corporate-strategy team analyzed each business unit to find opportunities to improve operations or possibly divest the business. While Consumerco had built strong brand names and most of its product lines had enjoyed a dominant market share, this analysis suggested it had room to increase revenue significantly and earn even higher margins:

- Consumerco had been cutting back on R&D and advertising spending to generate cash for EG's efforts to diversify and to buffer poor performance in other parts of EG's portfolio. Boosting investments in R&D and advertising would likely lead to higher sales volumes in existing EG products and encourage the introduction of additional high-margin products.

- Despite Consumerco's dominant position in its market categories, its prices were lower than for less popular brands. The value created by price increases would more than offset any losses in volume.
- Consumerco's sales force was less than half as productive as sales forces at other companies selling through the same channels. Sales productivity could increase to near the level of Consumerco's peers.
- Consumerco had room to cut costs, particularly in purchasing and inventory management. In fact, the cost of sales could easily be reduced by one percentage point.

When the team factored in these possibilities, it found that Consumerco's value could be increased by at least 37 percent.

Similar analysis of Foodco showed that it was clearly a candidate for divestiture. Foodco's ROIC was less than its cost of capital, so its growth was destroying value. Its industry as a whole was extremely competitive, although a few large players were earning respectable returns. However, even their returns were starting to decline. The Consumerco brand, which Foodco used, was found to be of little value in building the business, and Foodco would be unable to develop significant scale economies, at least in the near future. To make matters worse, Foodco had a voracious appetite for capital to build facilities but was not generating a return on new investment sufficient to cover the cost of the capital (its opportunity cost to the shareholders providing the capital). Last, Foodco was a particularly strong divestiture candidate because a new owner that was a larger, growing competitor could dramatically improve its performance.

Woodco, too, was in a position to improve on its performance dramatically as planned under EG's ownership, if it could achieve the same level of performance as other top furniture companies. This would likely require Woodco to focus less on growth and more on higher margins. To do this, Woodco would need to build better management information and control systems, and stick to its familiar mass-market products instead of striking out into new upmarket furnishings, as it had planned.

Although this analysis suggested that Woodco also might be sold (for instance, to a company that bought and improved smaller furniture firms), it would make little sense for EG to sell Woodco right away, midway through its consolidation, when potential buyers might be concerned that the business could fall apart. If the consolidation succeeded, EG could sell Woodco for a much higher price in 12 to 18 months, and EG's value could increase as a result by 33 percent.

Newsco and Propco were both subscale and could not attract top talent as part of EG. Furthermore, ready buyers existed for both, so divestiture was the clear choice.

The consumer finance sector had become so competitive that the spread between borrowing costs and the rates Finco earned on new loans did not cover the consumer finance company's operating costs. It turned out that the existing loan portfolio might be sold for more than the entire business was worth. In effect, each year's new business was dissipating some of the value inherent in the existing loan portfolio. The team recommended that the board liquidate the portfolio and shut down Finco.

Looking for further internal improvements, the team found that EG's corporate staff had grown with the increasing complexity of its portfolio to the point where the business units had been obliged to add staff simply to interact with the corporate staff. By reducing the portfolio, EG would be able to cut corporate costs by 50 percent.

On the revenue side, EG had done little to take advantage of Consumerco's strong brands to incubate new businesses. A quick analysis showed that if EG could find new growth opportunities that generated $1.5 billion to $3 billion in sales, it could increase the market value of Consumerco by $2.4 billion or more. While the first priority was the immediate restructuring, EG decided to keep generating new growth ideas as well.

Turning next to EG's financial strategy, the team found that EG had been pursuing a policy of maintaining an AA bond rating from Standard & Poor's, and prided itself on being a strong investment-grade company. However, its sizable and stable free cash flows meant that EG could support much higher debt. The Consumerco business, which generated the bulk of the cash, was recession resistant. Also, not much reserve financial capacity would be needed, given the relative maturity of EG's core business and its limited need for capital. The company's executives also believed that EG could tap funding for a major expansion or acquisition, if it made economic sense. At a minimum, EG could raise $1.5 billion in new debt in the next six months and use the proceeds to repurchase shares or pay a special dividend. This debt would provide a more tax-efficient capital structure for EG, which would be worth about $600 million in present value to EG's shareholders (see Chapter 29).

All told, the restructuring could increase EG's value by 56 percent without the extra growth initiatives and by as much as 86 percent with successful growth initiatives, although these might be hard to realize. Exhibit 25.4 summarizes EG's restructuring plan.

SUMMARY

The key to constructing a portfolio of value-creating businesses is to analyze whether the company is currently the best owner of each business in the portfolio from a value-creating viewpoint. If another company would be a better owner for a business, then the business is a candidate for divestment. Conversely, if you identify businesses from which the company could create more

EXHIBIT 25.4 **EG Corporation: Value Created through Restructuring**

	DCF value of business plans, $ million	**New corporate strategy**, $ million	**Difference**, %	**Actions**
Consumerco	6,345	8,700	37	Operating improvements
Foodco	825	1,050	27	Divest
Woodco	1,800	2,400	33	Consolidate/divest
Newsco	600	600	–	Divest
Propco	450	480	7	Divest
Finco	105	135	29	Liquidate
Corporate overhead	(1,275)	(675)	n/a	Streamline
Debt tax benefit	–	600	n/a	
Total	8,850	13,290	50	
Debt	(900)	(900)	–	
Equity value	7,950	12,390	56	
New growth opportunities	–	2,400+	–	
Equity value with new growth opportunities	7,950	14,790+	86	

value than their present owners can, those businesses are appropriate acquisition targets.

The owner that qualifies as best for a business may change over the course of the business's life cycle and can vary with geography. A company in the United States, for instance, is likely to start up owned by its founders and to end its days in the portfolio of a company that specializes in extracting cash from businesses in declining sectors. In between, the business may have passed through a whole range of owners.

These facts about businesses have three critical implications for managers. First, divestitures may be as value-creating as acquisitions, so managers should not shrink from divesting businesses in their portfolio that another company might own better. Divestitures are not a sign of failure. Second, the process of scrutinizing the portfolio for possible additions and subtractions should be continual, because the definition of *best owner* for any business changes so much during its life cycle. Last, diversification is intrinsically neither good nor bad for any company. If the company is the best owner for a set of diverse businesses in its portfolio, then its diversification is by definition value-creating—and the reverse is also true.

26

Performance Management

The overall value that a company creates is the sum of the outcomes of innumerable business decisions that its managers and staff take at every level, from choosing when to open the door to customers to deciding whether to acquire a new business. A company needs systems to ensure that all of these decisions remain directed toward maximum value creation. Such performance management systems enable management to track the impact of those myriad decisions on value creation and to revise them if and when needed.

Performance management systems typically include long-term strategic plans, short-term budgets, capital budgeting systems, performance reporting and reviews, and compensation frameworks. All components of the performance management system should be aligned with the company's strategy, so they encourage decisions that maximize value. Finding the right balance between generating cash flows in the short term and investing for value creation in the long term is one of the most challenging tasks in setting up and implementing these systems. Especially in large and complex companies with many businesses, markets, and management layers, decisions tend to be biased toward short-term profit because it is the most readily available and widely understood performance measure. Investors, equity analysts, supervisory directors, the press, and even internal reporting processes all contribute to this short-term bias.

Whether performance management efforts succeed or fail depends not so much on the system—the metrics, corporate meeting calendars, scorecards, and so on—as on the rigor and honesty with which everyone engages in the process. Do the senior management team members really understand the economics of the business units they oversee? Do they drill down to a sufficiently fine-grained level within business units? Can they negotiate performance targets that are both challenging and achievable? Are trade-offs between the short term and the long term transparent? Are managers sufficiently rewarded for focusing on long-term value?

When performance management is working well, it helps an organization's various layers communicate frankly and effectively. It gives managers space to manage while assuring their bosses that agreed-upon levels of performance will be achieved. In many companies, communication between management layers revolves entirely around missing or hitting profit targets for groups of business segments, such as divisions or business units. With a good performance management system, such targets are carefully disaggregated to business segments that can be individually monitored and managed. Equal attention is paid to the long-term value-creating intent behind short-term profit targets, and people across the company are in constant communication about the adjustments needed to stay in line with long-term performance goals.

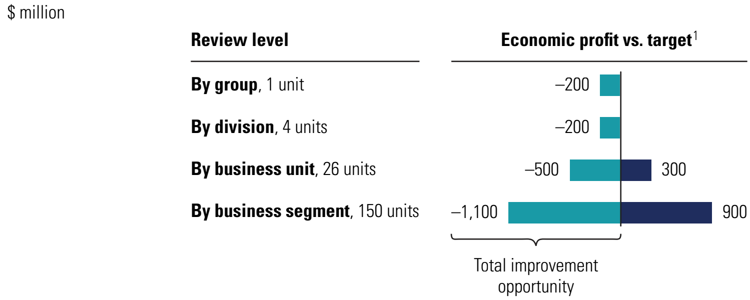
We approach performance management from both an analytical and an organizational perspective. The analytical perspective focuses first on ensuring that companies use the right metrics at the right level in the organization. Companies should not just rely on performance metrics for divisions or business units, but disaggregate performance to the level of individual business segments. In addition to historical performance measures, companies need to use diagnostic metrics that help them understand and manage their ability to create value over the longer term. Second, we analyze how to set appropriate targets, giving examples of analytically sound performance measurement in action. The organizational perspective describes the mind-sets and processes needed to support effective performance management.

ADOPTING A GRANULAR PERSPECTIVE

The larger the company—and the more diversified its portfolio—the more likely executives are to manage performance using high-level metrics, such as corporate or divisional top-line growth, profit, and return on invested capital (ROIC).[1] Such metrics are understandable shorthand for comparing performance among multiple divisions and myriad business units. But like all averages, they tend to hide the outliers—the strongest and weakest performers most in need of promotion or correction. Exhibit 26.1 shows one example where the four divisions of a diversified industrial company each fell between 5 and 10 percent short of overall economic-profit goals, suggesting only modest underperformance. Yet a closer look found that two-thirds of the company's 150 business segments were underperforming by as much as 40 percent, while the rest were outperforming enough to skew the averages. As a result, the opportunity for improvement turned out to be much larger than the executives had anticipated.

[1]This section draws on M. Goedhart, S. Smit, and A. Veldhuijzen, "Unearthing the Sources of Value Hiding in Your Corporate Portfolio," *McKinsey on Finance*, no. 48 (Autumn 2013): 2–9.

EXHIBIT 26.1 **Improvement Opportunity at Different Levels of Review**



[1] Economic profit target: €2,650 million.

Performance management should take place at the level of such business segments with individual product and service offerings, because that is where cash flows and value are created, not at the corporate center. Large companies are often organized in divisions or other groupings of related business units to reduce the number of direct reports to the CEO. Unfortunately, as in the example in Exhibit 26.1, this typically reduces business and operational transparency by averaging out performance of the individual business segments.

Moreover, the structure can get in the way of value-oriented decision making, because divisional managers have incentives to drive the performance of their own division, rather than that of the company as a whole. That companies struggle with this is clear from the typical annual budgeting process, which rarely leads to significant reallocations of capital, research and development (R&D), and marketing budgets across activities from one year to the next, regardless of performance and growth. Companies that more actively reallocate resources create more value, translating into 30 percent higher total returns to shareholders, on average.[2]

Executives need a finer-grained insight into pockets of value creation, beyond the usual level of divisions or even business units. In our experience, this means 50 or more business segments for a typical company earning $10 billion in revenue.[3] One rule of thumb is to further dissect businesses as long as underlying subsegments show significant differences in terms of growth and return on capital and are material in value relative to the company as a whole. Managers who find that their companies lack the necessary financial data, such as revenue, operating earnings, and capital expenditures, will probably also

[2] S. Hall, D. Lovallo, and R. Musters, "How to Put Your Money Where Your Strategy Is," *McKinsey Quarterly* (March 2012).

[3] These segments are similar to what we have elsewhere called "value cells." See, e.g., M. Giordano and F. Wenger, "Organizing for Value," *McKinsey on Finance*, no. 28 (Summer 2008): 20–25.

find that they rely too heavily on averages when setting strategic priorities, financial targets, and resource budgets.

Those who have the data will find that a finer-grained perspective offers several important benefits. First, it reveals more value-creation opportunities, as it dissects average performance and growth across the portfolio. For example, executives at one global company considered a consumer goods business in Asia to be the most successful in the company's portfolio because it consistently delivered double-digit top-line growth. But a more detailed analysis revealed that this business was losing market share because the relevant local markets were growing even faster—which would almost inevitably lead to lower value creation in the long term.

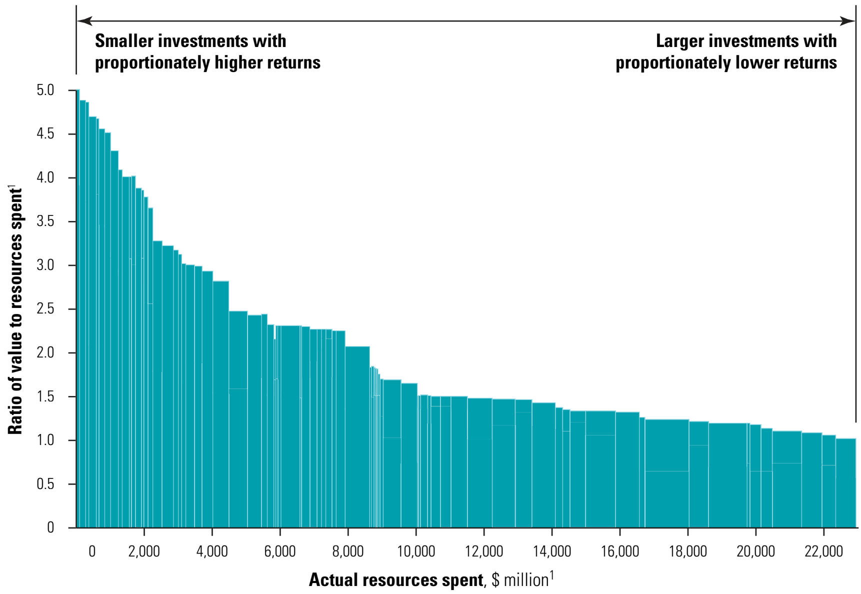
Second, taking a finer-grained perspective helps managers understand performance trends for business units that consist of several distinct product or market segments. While a higher number of segments might appear to complicate matters for executives and the corporate center, the reverse is often the case. For example, the aggregated growth rate and return on invested capital for a business unit will continuously change over time if its underlying segments have different growth rates and returns on capital, even if these are stable for each segment. Unless you analyze performance at the segment level, it will be very difficult to understand and forecast the business unit performance.

Finally, a granular approach offers executives better information for direct and radical interventions at the level of individual business segments, if and when needed. Such interventions can be required when a division-based structure leads to misaligned management incentives.[4] For example, one of the business units in a global industrial company used to cut its investments in research in breakthrough renewable-energy technology whenever it needed to achieve its overall profit target. Once the renewable-energy project was separated out as an independent unit reporting directly to the executive team, investments were increased and stabilized based on the technology's long-term value-creation potential.

Ideally, companies should have such insights in value creation from investments in strategic resources across all individual business segments. This should not include just investments in physical capital alone—especially in companies where investments in R&D and brand advertising exceed capital investments by a wide margin (such as in the pharmaceutical, high-tech, and consumer goods sectors). For example, one consumer goods company analyzed planned investments and value creation for about 100 business segments. As Exhibit 26.2 shows, some segments with very strong value potential were actually planning for limited investments, while some of the largest investments went to segments that returned much lower value per dollar of investment. How much of the investments should be reallocated to the more

[4]Giordano and Wenger, "Organizing for Value."

EXHIBIT 26.2 **Value Creation from Investments in 100 Business Segments**



[1] Resources spent is sum of brand advertising, research and development, and capital expenditures over the next 5 years.

productive segments depends on how much those segments can invest at the same attractive returns and whether lower investments in the less productive segments might lead to significantly lower or negative returns. But a company's executives should be aware of such large differences in resource productivity and investigate whether a reallocation of resources could lead to higher value creation for the company as a whole.

CHOOSING THE RIGHT METRICS

Companies need metrics that will monitor their long-term health as well as their short-term performance. They also need to set appropriate targets in these dimensions. This section describes how they might achieve both analytical tasks, and provides some examples of the potential benefits.

Identifying Value Drivers

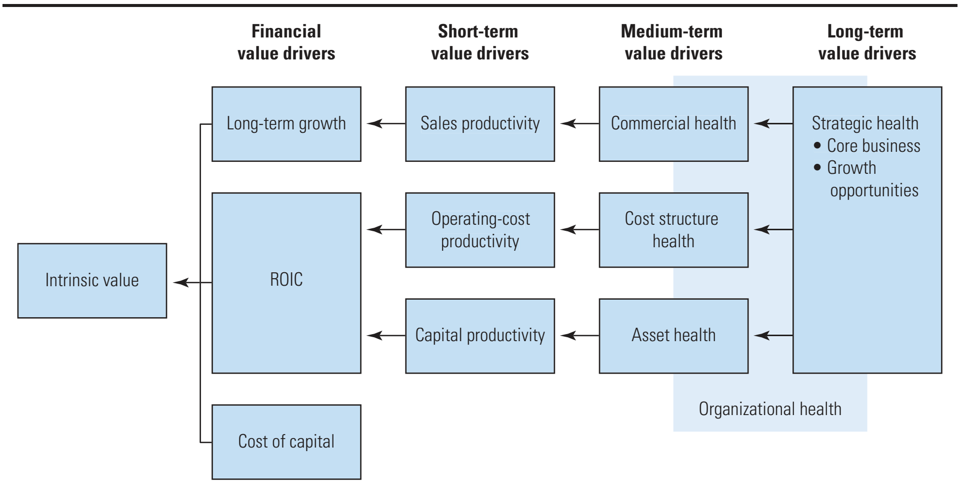
Think of a patient visiting the doctor. The patient may be feeling fine, in the sense of meeting requirements for weight, strength, and energy. But if cholesterol is above the target level that medical science has established as safe, the patient may need to take corrective action now to prevent future heart disease. Similarly, if a company shows strong growth and return on invested capital

(ROIC), it still needs to know whether that performance is sustainable. Comparing readings of company health indicators against meaningful targets can tell us whether a company has achieved impressive past financial results at a cost to its long-term health, perhaps crippling its ability to create value in the future.

To see the critical difference between companies' recorded performance and their long-term health, consider the pharmaceutical industry. In the year after the patent on a drug expires, sales of that drug often decline by 50 to 75 percent or more, as generic producers lower prices and steal market share. Investors know that future profits will suffer when a major product will be going off patent in a couple of years with no replacement on the horizon. In such a case, the company could have strong current performance but a poor performance outlook reflected in a low market value, because market values reflect long-term health, not just short-term profits. Or consider retail chains that sometimes maintain apparently impressive margins by scrimping on store refurbishment and brand building, to the detriment of their future competitive strength.

We can gain insight into a company's health by examining the drivers of long-term growth and ROIC, the key drivers of value creation. A value driver tree, as shown in Exhibit 26.3, illustrates how short-, medium-, and long-term value drivers influence financial performance. The left side of the exhibit shows the financial drivers of value: revenue growth and ROIC. Proceeding to the right, the exhibit calls out short-term value drivers, followed by medium- and long-term value drivers. The choice of a particular value driver, along with targets for testing and strengthening each one, should vary from company to company, reflecting each company's different sectors and aspirations.

EXHIBIT 26.3 **Value Driver Tree**



This framework shares some elements with the balanced scorecard introduced in a 1992 *Harvard Business Review* article by Robert Kaplan and David Norton.[5] Numerous nonprofit and for-profit organizations have subsequently advocated and implemented the balanced-scorecard idea. Its premise is that financial performance is only one aspect of performance. Equally important to long-term value creation, Kaplan and Norton point out, are customer satisfaction, internal business processes, learning, and revenue growth.

Our concept of value drivers resembles Kaplan and Norton's nonfinancial metrics. Where we differ is in advocating that companies choose their own set of metrics for the outermost branches of the tree, under the generic headings set out here, and tailor their choice to their industry and strategy. Such tailoring is critical to setting the right strategic priorities. For example, product innovation may be important to companies in one industry, while for companies in another, tight cost control and customer service may matter more. The way executives set priorities for value drivers should reflect these differences. Similarly, an individual company will have different value drivers at different points in its life cycle.

Every company will need to develop its own appropriate value driver metrics, but using the eight generic categories of short-, medium-, and long-term drivers presented in Exhibit 26.3 as a starting point for analysis will ensure that a company systematically explores all the important ones.

Short-term value drivers Short-term value drivers are the immediate drivers of historical ROIC and growth. They are typically the easiest to quantify and monitor frequently (monthly or quarterly). They are indicators of whether current growth and ROIC can be sustained, will improve, or will decline over the short term. They might include cost per unit for a manufacturing company or same-store sales growth for a retailer.

Following the growth and ROIC framework in Exhibit 26.3, short-term value drivers fall into three categories:

1. *Sales productivity* metrics are the drivers of recent sales growth, such as price and quantity sold, market share, the company's ability to charge higher prices relative to peers (or charge a premium for its product or services), sales force productivity, and, for retailers, same-store sales growth versus new-store growth.
2. *Operating-cost productivity* metrics are typically drivers of unit costs, such as the component costs for building an automobile or delivering a package. UPS, for example, is well known for charting out the

[5] Robert S. Kaplan and David P. Norton, "The Balanced Scorecard: Measures That Drive Performance," *Harvard Business Review* 80, no. 1 (January 1992): 71–79.

optimal delivery path of its drivers to enhance their productivity and for developing well-defined standards on how to deliver packages.

3. *Capital productivity* measures how well a company uses its working capital (inventories, receivables, and payables) and its property, plant, and equipment. Dell revolutionized the personal-computer business by building to order so it could minimize inventories. Because the company kept inventory levels so low and had few receivables to boot, it could, on occasion, operate with negative working capital.

When assessing short-term corporate performance, separate the effects of forces that are outside management's control (both good and bad) from things management can influence. For instance, upstream oil company executives shouldn't get much credit for higher profits that result from higher oil prices, nor should real estate executives for higher real estate prices (and the resulting higher commissions). Oil company performance should be evaluated with an emphasis on new reserves and production growth, exploration costs, and drilling costs. Real estate brokerages should be evaluated primarily on the number of sales, not whether housing prices are increasing or decreasing.

Medium-term value drivers Medium-term value drivers look forward to indicate whether a company can maintain and improve its growth and ROIC over the next one to five years (or longer for companies such as pharmaceutical manufacturers that have long product cycles). These metrics may be harder to quantify than short-term measures and are more likely to be measured annually or over even longer periods.

The medium-term value drivers fall into three categories:

1. *Commercial-health* metrics indicate whether the company can sustain or improve its current revenue growth. These metrics include the company's product pipeline (talent and technology to bring new products to market over the medium term), brand strength (investment in brand building), and customer satisfaction. Commercial-health metrics vary widely by industry. For a pharmaceutical company, the obvious priority is its product pipeline. For an online retailer, customer satisfaction and brand strength may be the most important components of medium-term commercial health. For a consumer electronics company, multiyear price trends for its individual products are an important indicator, as steadily declining prices often indicate lack of innovation compared with competitors.
2. *Cost structure health* metrics measure a company's ability to manage its costs relative to competitors over three to five years. These metrics might include assessments of programs such as Six Sigma, a method made famous by General Electric and adopted by other companies to reduce

costs continually and maintain a cost advantage relative to their competitors across most of their businesses.

3. *Asset health* measures how well a company maintains and develops its assets. For a hotel or restaurant chain, the average time between remodeling projects may be an important driver of asset health.

Long-term strategic value drivers Metrics for gauging long-term strategic health show the ability of an enterprise to sustain its current operating activities and to identify and exploit new growth areas. A company must periodically assess and measure the threats—including new technologies, changes in customer preferences, and new ways of serving customers—that could make its current business less profitable. For example, the growth of market share captured by new entrants to the sector can be an insightful metric of strategic health for a company. New entrants often rely on radically different business models that incumbents may find hard to compete with. Even small current market shares for such attackers could translate into significant strategic threats over the longer term. Illustrations are found in the success of PayPal in the payments sector, Ryanair in the European airline sector, and Aldi or Lidl in the European supermarket sector. In assessing a company's long-term strategic health, it can be hard to identify specific metrics; those situations require more qualitative milestones, such as progress in selecting partners for mergers or for entering a market.

Besides guarding against threats, companies must continually watch for new growth opportunities, whether in related industries or in new geographies.

Organizational health The final element of corporate well-being is organizational health, which measures whether the company has the people, skills, and culture to sustain and improve its performance. Diagnostics of organizational health typically measure the skills and capabilities of a company, its ability to retain its employees and keep them satisfied, its culture and values, and the depth of its management talent. Again, what is important varies by industry. Pharmaceutical companies need deep scientific innovation capabilities but relatively few managers. Retailers need lots of trained store managers, a few great merchandisers, and in most cases, store staff with a customer-service orientation.

Benefits of Understanding Your Business's Value Drivers

Clearly understanding a business's value drivers has several advantages. First, if managers know the relative impact of their company's value drivers on long-term value creation, they can make explicit trade-offs between pursuing a critical driver and allowing performance against a less critical driver to deteriorate. This is particularly helpful for choosing between activities that deliver short-term performance and those that build the long-term health of the business. These trade-offs are material: increasing investment for the long term will cause short-term returns to decline, as management expenses some of the costs, such as R&D or advertising, in the year they occur rather than the year the investments achieve their benefits. Other costs are capitalized but will not earn a return before the project is commissioned, so they too will suppress overall returns in the short term. Understanding the long-term benefits of sacrificing short-term earnings in this way should help corporate boards support managers in making investments that build a business's long-term capability to create value.

Clarity about value drivers also enables the management team to set priorities so that activities expected to create substantially more value take precedence over others. Setting priorities encourages focus and often adds more to value than efforts to improve on multiple dimensions simultaneously. For example, reducing accounts receivable in telecom services creates value, but far less so than increases in customer retention levels. And improvements in customer retention might well require a company to refrain from cutting back on customer credit. Without an explicit discussion of such priorities and trade-offs, different members of the management team could interpret and execute the business strategy in numerous ways.

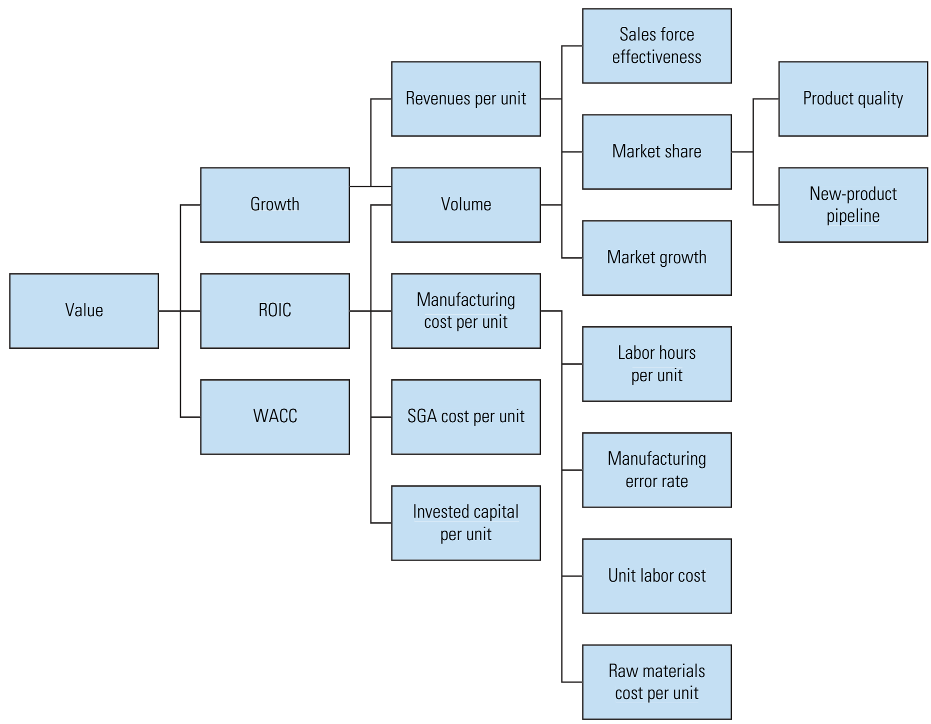
In general, distinctive planning and performance management systems promote a common language and understanding of value drivers that shape the way top management and employees think about creating value at each level of the organization. For example, in a pharmaceutical company, distinctive performance management would encourage discussion and coordinated action across the organization about specific steps to increase the speed of product launches and so accelerate value creation. In contrast, performance management in refining and other commodity-based process industries would focus on operational excellence in terms of capacity utilization and operational expenses.

Tailoring Value Driver Trees to Specific Companies

The value driver tree is a systematic method for analytically and visually linking a business's unique value drivers to financial metrics and shareholder value. Each element of financial performance is broken down into value drivers. Exhibit 26.4 shows a simple value driver tree developed for a manufacturing company.

Our experience has taught us that developing different initial versions of trees based on different hypotheses and business knowledge will stimulate the identification of unconventional sources of value. The information from these versions should then be integrated into one tree (or in some cases, a few trees) that best reflects the understanding of the business.

EXHIBIT 26.4 **Simple Value Driver Tree: Manufacturing Company**



To illustrate this process, we apply it to a temporary-help company. Exhibit 26.5 shows four different approaches used to develop the short-term portion of a value driver tree for this company. Exhibit 26.6 is a summary short-term value driver tree, created by adopting the most useful insights provided by the other trees. A tree based on profit-and-loss (P&L) structure often seems to managers to be the most natural and easiest to complete. Such a tree, however, is unlikely to provide the insight gained by looking at the business from the perspective of a customer, a branch of the company, or some other relevant vantage point. For example, in most parts of the world, fuel service stations create much more value per customer from selling food and beverage products than fuel. As a result, the conversion of station visits into food and beverage sales is an even more important value driver than the number of station visits itself.

When you develop value driver trees, pay particular attention to the drivers of growth, because of the lags between investing in developing a growth opportunity and the eventual payoff. These will differ between opportunities. Continuing the example of the temporary-help company, Exhibit 26.7 illustrates a value tree created for developing business in a new geographic

EXHIBIT 26.5 **Value Trees from Four Perspectives: Temporary-Help Company**

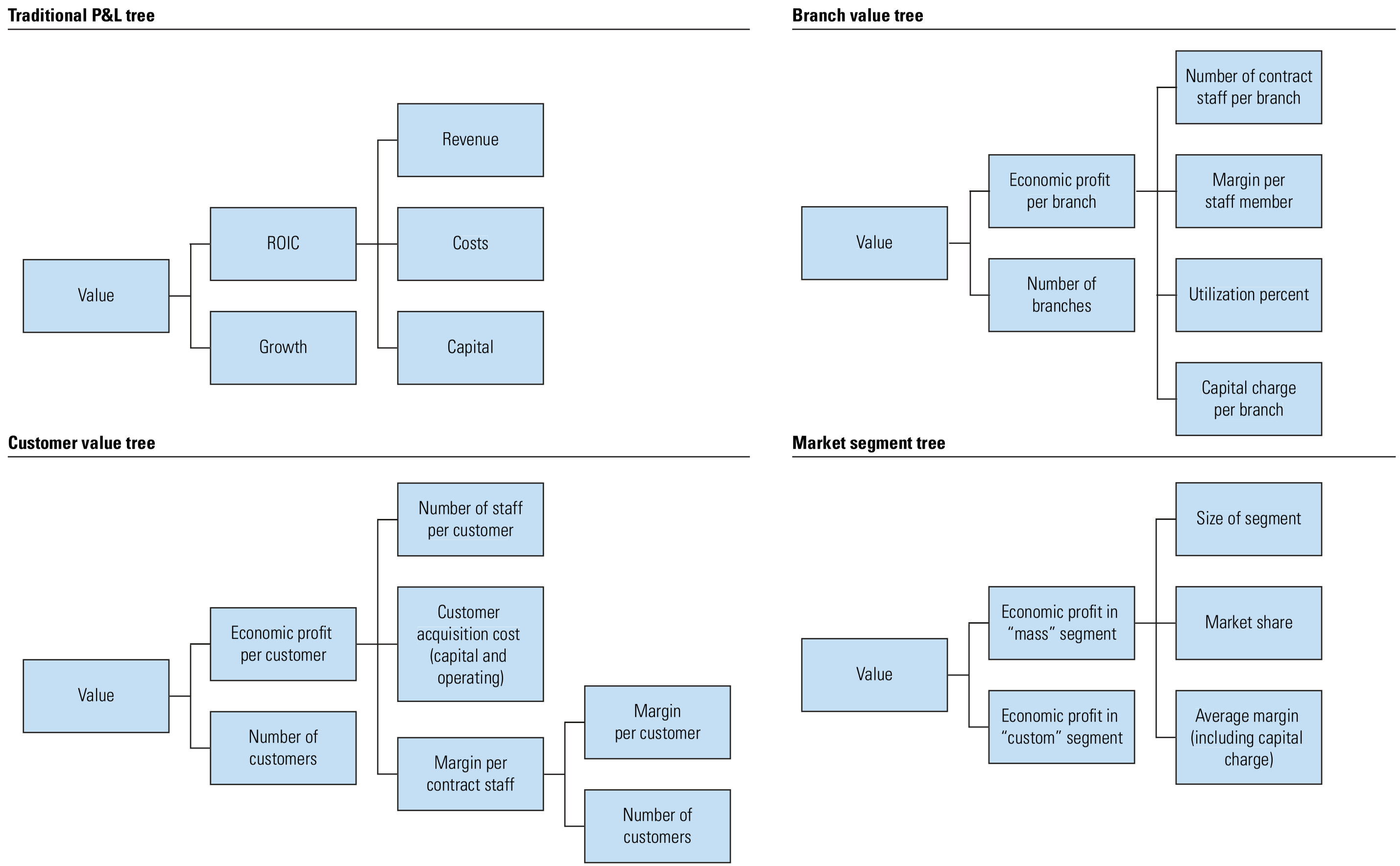
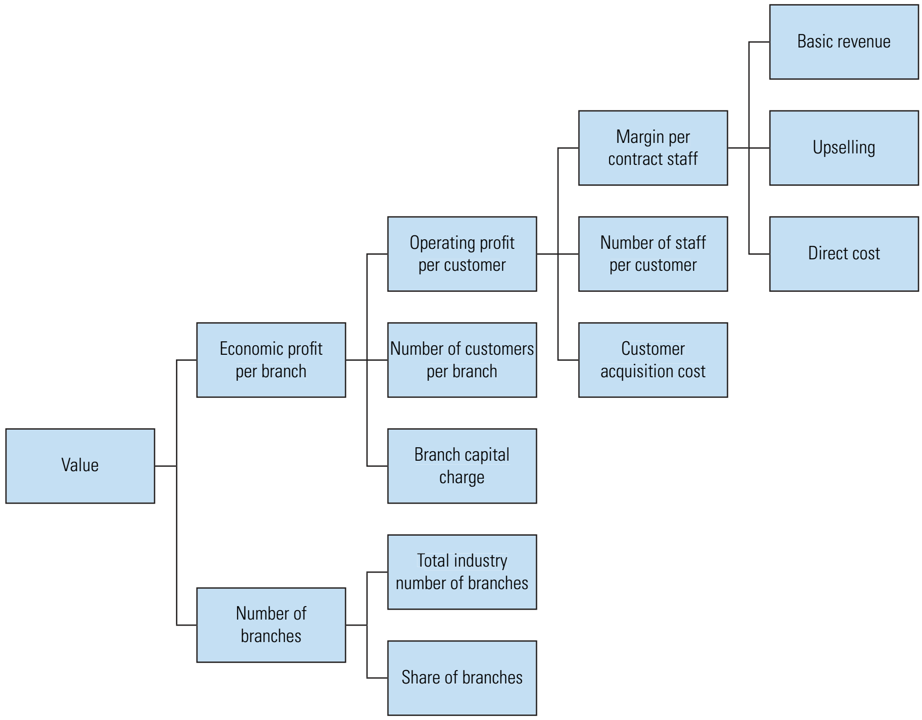


EXHIBIT 26.6 **Summary Short-Term Value Tree: Temporary-Help Company**



market. Important value drivers include building the client base and developing the staff capabilities in the new country, both of which take considerable time to achieve.

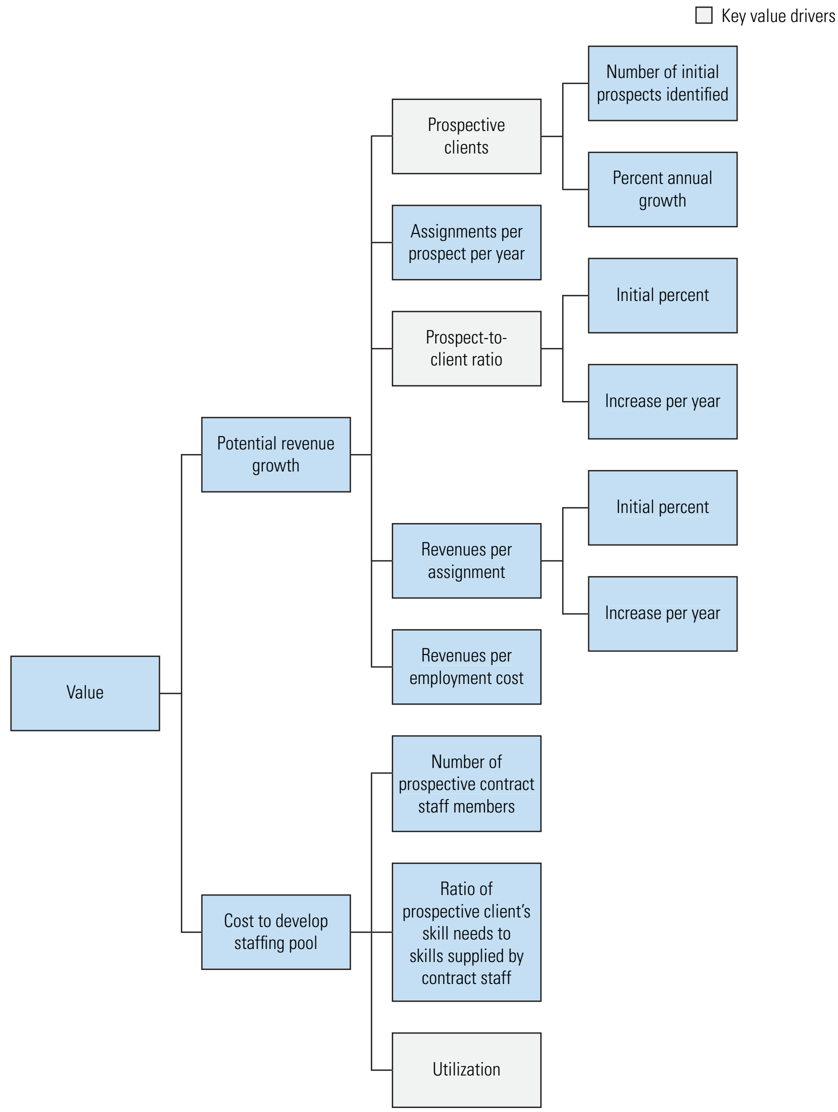
Every tip of a value tree is a potential value driver, so a full disaggregation would result in a large number of value drivers, more than could possibly be helpful for running the company. To be sure that the system is practical and effective, managers need to decide at this stage which drivers are the most important to value creation, and then they must focus on these.

Setting Effective Targets

To make best use of their understanding of key value drivers and to safeguard their company's future health, managers need to agree on what to target for each driver. Targets should be both challenging and realistic enough that managers can take responsibility for meeting them.

Businesses can identify realistic opportunities and targets by studying world-class competitors' performance on a particular value metric or milestone and comparing it with their own potential. Alternatively, executives can look

EXHIBIT 26.7 **Summary Medium-Term Value Tree: Temporary-Help Company, New Geographic Market**



at the performance of high-performing firms from a different but similar sector. For instance, a petroleum company might benchmark product availability in its service station shops against a grocery retailer's equivalents. This is in part how lean-manufacturing approaches developed by automakers have been successfully transplanted into many other industries, including retailing and services.

Businesses can also learn from internal benchmarks taken from the same operation in different time intervals, or from comparable operations in different businesses controlled by the same parent. These may be less challenging than external benchmarks, as they do not necessarily involve looking at world-class players. However, internal benchmarks deliver several benefits. The data are likely to be more readily available, since sharing the information poses no competitive or antitrust problems. Also, unearthing the causes of differences in performance is much easier, as the unit heads can visit the benchmark unit. Finally, these comparisons facilitate peer review.

Most performance targets are a single point, but a range can be more helpful. General Electric, for example, sets base and stretch targets. The base target is set by top management based on prior-year performance and the competitive environment. The company expects managers to meet the base target under any circumstance; those who fall short rarely last long. The stretch target is a statement of the aspiration for the business and is developed by the management team responsible for delivery. Those who meet their stretch targets are rewarded, but those who miss them are seldom penalized. Using base and stretch targets makes a performance management system much more complex, but it allows the managers of the business units to communicate what they aspire to deliver (and what it would take for them to achieve that goal) without committing them to delivery.

At some organizational level below divisions or business units, accurately allocating key components of invested capital and costs may become impossible. In that case, performance targets are best set in terms of particular elements of sales, operating, or capital productivity metrics instead of return on capital itself (see Exhibit 26.3). For example, most consumer electronics companies have concentrated their manufacturing, R&D, and brand-advertising activities in a handful of locations. The invested capital and costs of these centralized activities are largely independent of what happens in individual product and market segments (think single-serve coffee machines in Southern California). Although some companies allocate the centralized capital and costs to individual segments by their sales volumes or sales revenues, this has little economic relevance.[6] Furthermore, segment managers have little or no control over the efficiency of the centralized activities. In such situations, it is more effective to set targets for underlying value drivers such as market share growth, gross margin, and inventory levels rather than return on capital. Of course, companies should ensure that the targets are consistent with driving aggregate return on invested capital of the business units and divisions encompassing the segments. At some point, expansion of market share and sales will require additional production capacity. Once that point is reached, the associated

[6]For example, declining sales in one segment would imply increasing capital allocated to other segments even if their sales would be unchanged.

investments and operating costs need to be factored in for target setting in individual business segments.

The Right Metrics in Action

Choosing the right performance metrics can provide new insights into how a company might improve its performance in the future. For instance, Exhibit 26.8 illustrates the most important value drivers for a pharmaceutical company. The exhibit shows the key value drivers, the company's current performance relative to best- and worst-in-class benchmarks, its aspirations for each driver, and the potential value impact from meeting its targets. The greatest value creation would come from three areas: accelerating the rate of release of new products from 0.5 to 0.8 per year, reducing from six years to four the time it takes for a new drug to reach 80 percent of peak sales, and cutting the cost of goods sold from 26 percent to 23 percent of sales. Some of the value drivers (such as new-drug development) are long-term, whereas others (such as reducing cost of goods sold) have a shorter-term focus.

Similarly, focusing on the right performance metrics can help reveal what may be driving underperformance. A consumer goods company we know illustrates the importance of having a tailored set of key value metrics. For several years, a business unit showed consistent double-digit growth in economic profit. Since the financial results were consistently strong—in fact, the strongest across all the business units—corporate managers were pleased and did not ask many questions of the business unit. One year, the unit's economic profit unexpectedly began to decline. Corporate management began digging deeper into the unit's results and discovered that for the preceding three years, the unit had been increasing its profit by raising prices and cutting back on product promotion. That created the conditions for competitors to take away market share. The unit's strong short-term performance was coming at the expense of its long-term health. The company changed the unit's management team, but lower profits continued for several years as the unit recovered its position with consumers.

A well-defined and appropriately selected set of key value drivers ought to allow management to articulate how the organization's strategy creates value. If it is impossible to represent some component of the strategy using the key value drivers, or if some key value driver does not serve as a building block in the strategy, then managers should reexamine the value trees. Similarly, managers must regularly revisit the targets they set for each value driver. As their business environment changes, so will the limits of what they can achieve.

ORGANIZATIONAL SUPPORT

Performance metrics give managers information about how well their company is performing now and its likely future performance. But without the

EXHIBIT 26.8 **Key Value Drivers: Pharmaceutical Company**

right mechanisms to support managers in acting on this information, an elaborate performance measurement system is useless. Indeed, the measurements are less important than how the organization uses them. We've found that the following ingredients lead to more effective organizational support for corrective action.

Buy-In to Performance Management at All Levels

Companies that succeed at performance management instill a value-creating mind-set throughout the business. Their employees at all levels understand the core principles of value creation (see Chapter 2), know why it matters, and make decisions that take into account the impact on value. They achieve this understanding if their top managers consistently reinforce the importance of the value mind-set in all their communications, build the capabilities to understand value creation, and (as discussed at the end of this section) link value creation to the reward process. Midlevel managers are unlikely to buy into managing for longer-term value creation if top management regularly cuts R&D, advertising, or employee development to meet short-term profit targets. Without leadership from the top, a company cannot build a successful performance management system.

Comfort with Transparency

Successful performance management requires transparency about value creation at all levels in the company—all the way to individual business segments. Executives will need to explain the benefits of such transparency to skeptical managers of divisions and business units.

One of the benefits is that it allows managers of divisions and business units to better understand where their businesses create value—and how much they create relative to other businesses in the company. Bad performance from a particular business can no longer be camouflaged by good performance from other businesses in the same division or business unit. When managers can see which trade-offs are being made and why, it's easier to get behind allocation and budgeting decisions—and harder to be defensive.

Another advantage is that transparency at fine-grained business levels allows for a more meaningful performance dialogue. By turning the dialogue from one largely about changes in top-line growth and earnings to one that includes concrete initiatives and their impact on market share, gross margin, and capital turnover, line managers will have more opportunities to develop new businesses, exit less attractive markets, and initiate promising R&D projects on their true merits.

Finally, performance management at this level of detail allows companies to create packages of management incentives and compensation that are more tailored to what each business is expected to accomplish. Instead of rewarding just top-line growth, they can combine measures of top-line growth with, for example, market share increases in particular product and market segments or successes in specific research projects.

It is important for executives to clarify that this doesn't mean micromanagement of the company's businesses. That would not be productive—or even feasible, given the amount and complexity of the information from so many business segments. What counts is that executives have the transparency to understand performance at all levels in the company and intervene when and where needed.

Motivating Targets

Managers and staff responsible for meeting targets need to be involved in setting them, so they understand the targets' purpose and will strive to deliver them. Consider the experience of one global consumer goods company. When the corporate technical manager ordered that all the company's bottling lines should achieve 75 percent operating efficiency regardless of their current level, some plant operators rebelled. Operators at one U.S. plant concluded that, at 53 percent utilization, their plant was running as well as it had ever run, and they refused to aim for higher performance. Then the plant launched a process permitting the operators to set their own performance goals. The same U.S. plant managed to raise efficiency above the 75 percent target over a period of only 14 months.

Higher-level managers also need to be seen to embrace the whole set of targets and be able to explain their interrelation. Otherwise, the targets may simply appear as a set of arbitrary aspirations imposed from above.

Fact-Based and Forward-Looking Performance Reviews

In too many performance reviews, senior management does not understand enough about the business to assess whether a business unit's performance resulted from the management team's cleverness and hard work or simply from good or bad luck. Executives should base performance reviews on facts in order to ensure honest appraisal and make corrective action effective.

The best way to record facts for performance reviews is on a scorecard incorporating the key value metrics from the value driver analysis. Managers may be tempted to think that financial reports alone can serve as the basis for performance discussions. Financial results are only part of the review process, however. Key value metrics show the operating performance behind the financial results.

Corporate centers may find it convenient to impose one scorecard on all business units, but this is shortsighted. Although a single scorecard makes it easier to compare units, management forgoes the chance to understand each unit's unique value drivers. Ideally, companies should have tailored scorecards that cascade through each business, so that each manager can monitor the key value drivers for which he or she is accountable.

Performance reviews should focus on future actions rather than just historical results. Managers should use the reviews as problem-solving sessions to determine the root causes of bad performance and ways to fix them, rather than identifying who is to blame. To succeed, reviewers must first prepare thoroughly for reviews. They should then turn traditionally one-sided discussions ("boss tells, subordinate does") into collaborative sessions. Finally, they should ensure that agreed-upon action plans are in place as formal end products of the reviews. Bringing groups together for performance reviews will introduce even more well-informed insights and perspectives, making problem solving more effective, increasing a sense of accountability, and deflecting potential sandbagging. Orchestrated with care, a performance review—even when results are below expectations—can help motivate frontline managers and employees, rather than deflating them.

Appropriate Consequences

Performance management is effective only if it has real and visible consequences for the managers involved. This might seem obvious but is not always the case—even in the world's largest companies. One example is Unilever in the period before 2009, when CEO Paul Polman changed what he called "entitlement-based base pay" to "performance-based variable pay" in order to drive the company's performance.

Attaching consequences to performance should work both ways. Clear and recurring underperformance by managers should lead to lower financial and nonfinancial rewards and ultimately demotion or discharge. Ongoing strong performance should be appropriately rewarded. Rewards today are typically financial and, according to some critics, have become excessive. Certainly in the late 1990s, as the long bull market extended, executives received extraordinary rewards, particularly in stock options, that had little to do with their own performance and everything to do with factors beyond their reach, such as declining interest rates. When the stock market fell, companies maintained the higher level of rewards.

Many have argued that current executive compensation systems remain broken because they rarely link compensation to the company's long-term value creation. Although we have no solution for a perfect alignment of the two, we do have some ideas for improvement:

- Link stock-based compensation to the specific performance of the company, stripping out broad macroeconomic and industry effects (see Chapter 3).

- Tie some portion of compensation to corporate results several years after the year of the review, even if that means deferring payment of that portion until after the executive's departure from the company.
- Move away from formulaic compensation to a more holistic system that incorporates performance against both quantifiable and nonquantifiable value drivers (including long-term company health metrics), even if it requires more judgment by the evaluator.

SUMMARY

For many companies, performance management is the most important driver of value creation. Yet performance management is difficult to describe, let alone execute well. The rewards, however, are great for companies that can build a value-creation mind-set, clarify the business's short- and long-term value drivers, set stretch targets that people believe are achievable, conduct fact-based performance reviews, and motivate their people effectively.

27

Mergers and Acquisitions

Mergers and acquisitions (M&A) are an important element of a dynamic economy. At different stages of an industry's or a company's life span, resource decisions that once made economic sense no longer do. For instance, the company that invented a groundbreaking innovation may not be best suited to exploit it. As demand falls off in a mature industry, companies are likely to have built excess capacity. At any time in a business's history, one group of managers may be better equipped to manage the business than another. At moments like these, acquisitions are often the best or only way to reallocate resources sensibly and rapidly.

Acquisitions that reduce excess capacity or put companies in the hands of better owners or managers typically create substantial value both for the economy as a whole and for investors. You can see this effect in the increase in the combined cash flows of the many companies involved in acquisitions. Even though acquisitions overall create value, however, the distribution of any value they create tends to be lopsided, with the selling companies' shareholders capturing the bulk. In fact, most empirical research shows that one-third or more of acquiring companies destroy value for their shareholders because they transfer all the benefits of the acquisition to the selling companies' shareholders.

The challenge for managers, therefore, is to ensure that their acquisitions are among those that *do* create value for their shareholders. To that end, this chapter provides a framework for analyzing how to create value from acquisitions and summarizes the empirical research. It discusses the archetypal approaches that are most likely to create value, as well as some more difficult strategies that are often attempted. It provides practical advice on how to estimate and achieve operating improvements and whether to pay in cash or in stock. Last, it reminds managers that stock markets respond to the expected impact of acquisitions on intrinsic value, not accounting results.

VALUE CREATION FRAMEWORK

Acquisitions create value when the cash flows of the combined companies are greater than they would have otherwise been. If the acquirer doesn't pay too much for the acquisition, some of that value will accrue to the acquirer's shareholders. Acquisitions are a good example of the conservation of value principle (explained in in Chapter 3).

The value created for an acquirer's shareholders equals the difference between the value received by the acquirer and the price paid by the acquirer:

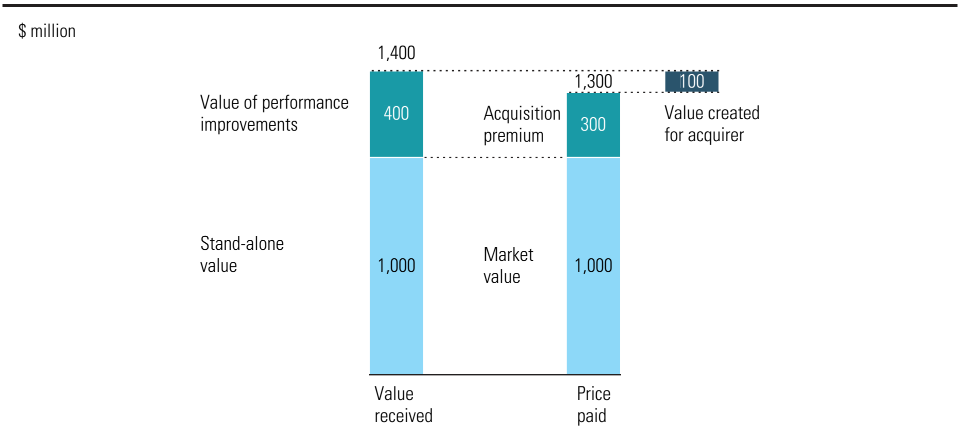
$$\text{Value Created for Acquirer} = \text{Value Received} - \text{Price Paid}$$

The value received by the acquirer equals the intrinsic value of the target company as a stand-alone company run by its former management team plus the present value of any performance improvements to be achieved after the acquisition, which will show up as improved cash flows for the target's business or the acquirer's business. The price paid is the market value of the target plus any premium required to convince the target's shareholders to sell their shares to the acquirer:

$$\begin{aligned}\text{Value Created for Acquirer} = {} & (\text{Stand-Alone Value of Target} \\ & + \text{Value of Performance Improvements}) \\ & - (\text{Market Value of Target} \\ & + \text{Acquisition Premium})\end{aligned}$$

Exhibit 27.1 uses this framework to illustrate a hypothetical acquisition. Company A buys Company B for \$1.3 billion, which includes a 30 percent

EXHIBIT 27.1 **Acquisition Evaluation Framework**



premium over its market value. Company A expects to increase the value of B by 40 percent through various operating improvements, so the value of B to A is \$1.4 billion. Subtracting the purchase price of \$1.3 billion from the value received of \$1.4 billion leaves \$100 million of value created for Company A's shareholders.

In the case where the stand-alone value of the target equals its market value, then value is created for the acquirer's shareholders only when the value of improvements is greater than the premium paid:

$$\text{Value Created} = \text{Value of Improvements} - \text{Acquisition Premium}$$

Examining this equation, it's easy to see why most of the value created from acquisitions goes to the seller's shareholders: if a company pays a 30 percent premium, then it must increase the value of the target by at least 30 percent to create any value.

Exhibit 27.2 shows the value created for the acquirer's shareholders relative to the amount invested in acquisitions at different levels of premiums and operating improvements. For example, Company A, from the example just considered, paid a 30 percent premium for Company B and improved B's value by 40 percent, so the value created for the acquirers' shareholders represents 8 percent of the amount Company A invested in the deal.

If we further assume that Company A was worth about three times Company B at the time of the acquisition, this major acquisition would be expected to increase Company A's value by only about 3 percent: \$100 million of value creation (see Exhibit 27.1) divided by Company A's value of \$3 billion. As this

EXHIBIT 27.2 **Value Creation for Given Performance Improvements and Premium Paid**

Value creation as % of deal value

Premium paid, % of stand-alone target value					
0	10	20	30	40	50
10	0	9	18	27	36
20	–8	0	8	17	25
30	–15	–8	0	8	15
	10	20	30	40	50

Value of performance improvements, % of stand-alone target value

EXHIBIT 27.3 **Selected Acquisitions: Significant Improvements**

%

	Year	Value of improvements relative to target value[1]	Premium paid	Net value created relative to price[2]
Kraft/Cadbury	2010	70–90	50	20–40
InBev/Anheuser-Busch	2008	35–45	20	15–25
Henkel/National Starch	2007	60–90	55	5–25
Kellogg/Keebler	2000	45–70	15	30–50
PepsiCo/Quaker Oats	2000	35–55	10	25–40
Clorox/First Brands	1998	70–105	60	5–25

[1] Present value of announced performance improvements divided by target value.
[2] Net value created from acquisition divided by purchase price.

example shows, it is difficult for an acquirer to create a substantial amount of value from acquisitions.

While a 40 percent performance improvement sounds steep, that's what better acquirers often achieve. Exhibit 27.3 presents estimates of the value created from several large deals in the consumer products sector. To estimate the gross value creation, we discounted the announced actual performance improvements at the company's weighted average cost of capital (WACC). The performance improvements were substantial, typically in excess of 50 percent of the value of the target. In addition, Kellogg and PepsiCo paid unusually low premiums for their acquisitions, allowing them to capture more value.

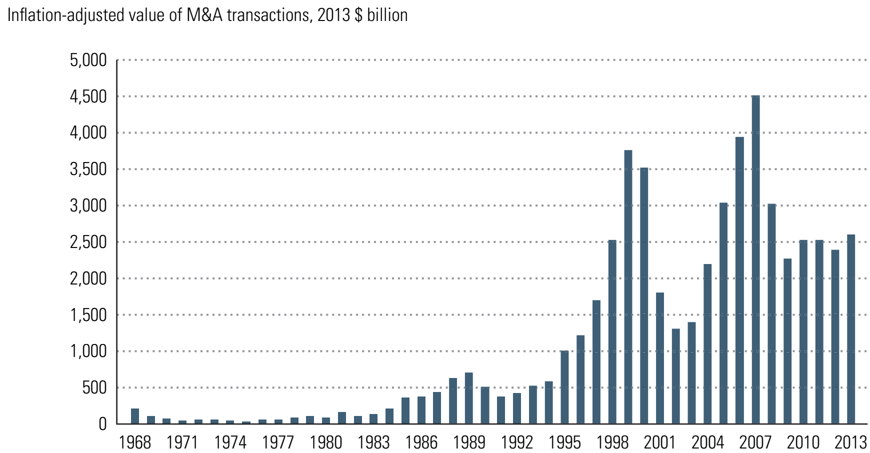
EMPIRICAL RESULTS

Acquisitions and their effects on value creation are a perennial topic of interest to researchers. Empirical studies of acquisitions have yielded useful insights into when they occur, whether they create value, and for whom they create value.

Acquisitions tend to occur in waves, as shown in Exhibit 27.4. Several factors drive these waves: We tend to see more acquisitions when stock prices are rising and managers are optimistic (though to maximize the amount of value created, they should really make acquisitions when prices are low). Low interest rates also stimulate acquisitions, especially heavily leveraged acquisitions by private-equity firms. Finally, one large acquisition in an industry encourages others in the same industry to acquire something, too.

For decades academics and other researchers have studied the question of whether acquisitions create value. Most studies have examined the stock price reaction to the announcement of acquisitions. One effect of this approach is that large acquisitions (relative to the size of the acquirer) tend to dominate the results. The market's assessment of small acquisitions is hard to discern, yet 95 percent of acquisitions by large companies are of targets that are smaller than 5 percent of the acquirer's market capitalization.

EXHIBIT 27.4 **Historical M&A Activity: U.S. and European Transactions**



Source: Dealogic, Capital IQ, Mergerstat, Thomson Reuters.

Researchers have shown that acquisitions do create value for the collective shareholders of the acquirer and the acquired company. According to McKinsey research on 1,770 acquisitions from 1999 through 2013, the combined value of the acquirer and target increased by about 5.8 percent on average.[1] So we can conclude that acquisitions tend to create value for the economy, through some combination of cost and revenue synergies.

First, we'll review the studies driven mostly by large acquisitions. While buying and selling shareholders collectively derive value from acquisitions, large acquisitions on average do not create any value for the acquiring company's shareholders. Empirical studies examining the reaction of capital markets to M&A announcements find that the average large deals (weighted by value) lower the acquirer's stock price between 1 and 3 percent.[2] Stock returns following the acquisition are no better. Mark Mitchell and Erik Stafford have found that acquirers underperform comparable companies on shareholder returns by 5 percent during the three years following the acquisitions.[3]

Another way to look at the question is to estimate the percentage of deals that create any value at all for the acquiring company's shareholders. McKinsey

[1]D. Cogman, "Global M&A: Fewer Deals, Better Quality," *McKinsey on Finance*, no. 50 (Spring 2014): 23–25.

[2]S. B. Moeller, F. P. Schlingemann, and R. M. Stulz, "Do Shareholders of Acquiring Firms Gain from Acquisitions?" (NBER Working Paper W9523, Ohio State University, 2003).

[3]M. L. Mitchell and E. Stafford, "Managerial Decisions and Long-Term Stock Price Performance," *Journal of Business* 73 (2000): 287–329.

research found that one-third created value, one-third did not, and for the final third, the empirical results were inconclusive.[4]

It comes as no surprise to find conclusive evidence that most or all of the value creation from large acquisitions accrues to the shareholders of the target company, since the target shareholders are receiving, on average, high premiums over their stock's preannouncement market price—typically about 30 percent.

These studies typically examine the stock market reaction to an acquisition within a few days of its announcement. Many have criticized using announcement effects to estimate value creation. The evidence on whether announcement effects persist is inconsistent. Sirower and Sahna have shown that the initial market reactions are persistent and indicate future performance for the next year.[5] Some of our colleagues, however, examined a different sample of larger transactions over a two-year period and found inconclusive evidence of persistence.[6]

Although studies of announcement effects give useful results for large samples, the same approach cannot be applied to individual transactions. While the market correctly assesses the results of transactions on average, that statistic does not mean its initial assessment of a single transaction will always be correct.

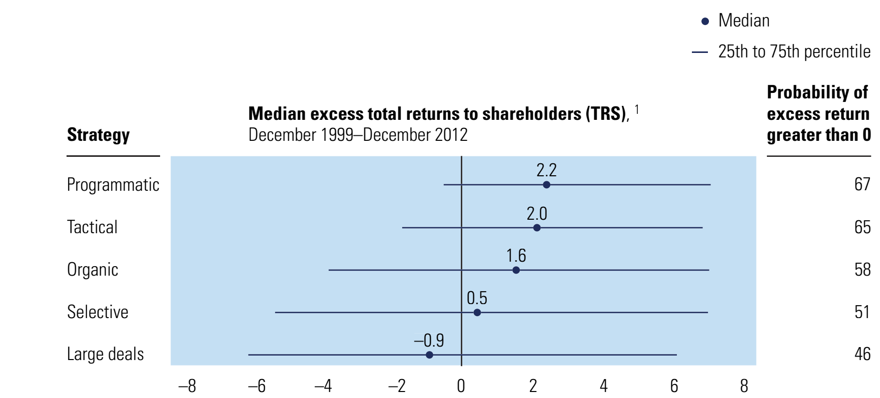
To overcome the large acquisition bias of the studies described, several of our colleagues looked at acquisition programs of companies rather than single acquisitions.[7] They examined 639 nonbanking companies from 1999 to 2010 and grouped them into five categories:

1. Programmatic acquirers completed many acquisitions, which amounted to a large percentage of their market capitalization.
2. Tactical acquirers also completed many deals, but these added up to a small percentage of their market capitalization.
3. Large-deal companies completed at least one deal that was larger than 30 percent of the acquiring company's value.
4. Organic companies conducted almost no M&A.
5. Selective acquirers are those that did not fit into the other four categories.

[4]W. Rehm and C. Siverstsen, "A Strong Foundation for M&A in 2010," *McKinsey on Finance*, no. 34 (Winter 2010): 17–22.
[5]M. Sirower and S. Sahna, "Avoiding the Synergy Trap: Practical Guidance on M&A Decisions for CEOs and Boards," *Journal of Applied Corporate Finance* 18, no. 3 (Summer 2006): 83–95.
[6]Rehm and Siverstsen, "A Strong Foundation for M&A in 2010."
[7]W. Rehm, R. Uhlaner, and A. West, "Taking a Longer-Term Look at M&A Value Creation," *McKinsey Quarterly* (January 2012).

EXHIBIT 27.5 **Success Rates of Observed Acquisition Strategies**

Global 1,000 nonbanking companies, %



[1] Outperformance against global industry index for each company.

Source: Dealogic.

Over the period 1999 through 2010, the programmatic, tactical, and organic companies all outperformed their peers in terms of total returns to shareholders, as shown in Exhibit 27.5. The large-deal companies underperformed, consistent with the announcement-effect studies. So M&A—if executed correctly—seems to be associated with outperformance.

That said, the averages conceal important details, such as industry structure and the match of an asset with a company's strategy. To illustrate how important it is for a company to figure out what's best for it, given its circumstances and capabilities, these colleagues also examined the results across industries (see Exhibit 27.6). The results varied. For example, large acquisitions tended to be more successful in slower-growing, mature industries, where

EXHIBIT 27.6 **Variable M&A Success by Industry**

Global 1,000 nonbanking companies, median excess total returns to shareholders (TRS), Dec. 1999–Dec. 2010, %

Top strategies in industry

	Industries							
Strategy	Consumer discretionary	Telecom	PMP[1]	High tech	CPG[1] and retail	Materials	Manufacturing, other industrials	Insurance and related
Programmatic	4.2	4.5	3.1	–1.2	3.2	4.5	0.7	0.1
Selective	2.0	1.3	6.4	–2.6	2.5	–1.5	4.8	1.7
Tactical	0.4	0.7	n/a[2]	1.2	2.6	–3.0	1.8	2.6
Large deals	–2.8	–0.9	2.0	–6.7	3.8	–0.3	3.5	4.0
Organic	–4.2	n/a[2]	n/a[2]	–2.0	1.4	n/a[2]	–5.2	9.8

[1] PMP = pharmaceutical and medical products; CPG = consumer packaged goods.
[2] Data not shown where category contained <5 companies.

Source: Dealogic.

there is great value to reducing excess capacity. By contrast, large deals in faster-growing sectors underperformed significantly. In those companies, the inward focus required to integrate a large acquisition diverted management's attention from the need for continual product innovation. Only the programmatic acquirers tended to outperform across most industries.

Researchers have also tried to find whether specific factors could be identified that differentiate deals that are successful from those that are unsuccessful, based on returns to the acquirer's shareholders. This research points to four characteristics that matter:

1. *Strong operators are more successful.* According to empirical research, acquirers whose earnings and share price grew at a rate above industry average for three years before the acquisition earn statistically significant positive returns on announcement.[8] Another study found similar results using the market-to-book ratio as a measure of corporate performance.[9]
2. *Low transaction premiums are better.* Researchers have found that acquirers paying a high premium earn negative returns on announcement.[10]
3. *Being the sole bidder helps.* Several studies have found that acquirer stock returns are negatively correlated with the number of bidders; the more companies attempting to buy the target, the higher the price.[11]
4. *Private deals perform better.* Acquisitions of private companies and subsidiaries of large companies have higher excess returns than acquisitions of public companies.[12]

Perhaps it is just as important to identify the characteristics that don't matter. There is no evidence that the following acquisition dimensions indicate either value creation or value destruction:

- Size of the acquirer relative to the target
- Whether the transaction increases or dilutes earnings per share

[8] R. Morck, A. Shleifer, and R. Vishny, "Do Managerial Objectives Drive Bad Acquisitions?" *Journal of Finance* 45 (1990): 31–48.
[9] H. Servaes, "Tobin's *q* and the Gains from Takeovers," *Journal of Finance* 46 (1991): 409–419.
[10] M. L. Sirower, *The Synergy Trap* (New York: Free Press, 1997); and N. G. Travlos, "Corporate Takeover Bids, Methods of Payment, and Bidding Firms' Stock Return," *Journal of Finance* 42 (1987): 943–963. The result was statistically significant in Sirower but not significant in Travlos.
[11] Morck et al., "Do Managerial Objectives Drive Bad Acquisitions?"; and D. K. Datta, V. K. Narayanan, and G. E. Pinches, "Factors Influencing Wealth Creation from Mergers and Acquisitions: A Meta-Analysis," *Strategic Management Journal* 13 (1992): 67–84.
[12] See, for example, L. Capron and J. Shen, "Acquisitions of Private versus Public Firms: Private Information, Target Selection and Acquirer Returns" (INSEAD Working Paper Series, 2005); and P. Draper and K. Paudyal, "Acquisitions: Public versus Private," *European Financial Management* 12, no. 1 (2006): 57–80.

- The price-to-earnings (P/E) ratio of the acquirer relative to the target's P/E
- The relatedness of the acquirer and the target, based on Standard Industrial Classification (SIC) codes

This empirical evidence is important because it shows that there is no magic formula to make an acquisition successful. Like any other business strategy, acquisitions are not inherently good or bad, just as marketing or research and development (R&D) are not inherently good or bad. Each deal must have its own strategic logic, and the company must have the relevant skills to execute deals or deal programs. In our experience, acquirers in the most successful deals have well-articulated, specific value creation ideas going into each deal. The strategic rationales for less successful deals tend to be vague, such as to pursue international scale, fill in portfolio gaps, or build a third leg of the portfolio.

ARCHETYPES FOR VALUE-CREATING ACQUISITIONS

The empirical analysis is limited in its ability to identify specific acquisition strategies that create value. This is because acquisitions come in a wide variety of shapes and sizes and also because there is no objective way to classify acquisitions by strategy. Furthermore, the stated strategy may not be the real strategy. Companies typically talk up all kinds of strategic benefits from acquisitions that are really all about cost cutting.

In the absence of empirical research, our suggestions for strategies that create value are based on our acquisitions work with companies. In our experience, the strategic rationale for an acquisition that creates value for acquirers typically fits one of the following six archetypes:

1. Improve the performance of the target company.
2. Consolidate to remove excess capacity from an industry.
3. Create market access for the target's (or, in some cases, the buyer's) products.
4. Acquire skills or technologies more quickly or at lower cost than they could be built in-house.
5. Exploit a business's industry-specific scalability.
6. Pick winners early, and help them develop their businesses.

If an acquisition does not fit one or more of these archetypes, it's unlikely to create value.

The strategic rationale for an acquisition should be a specific articulation of one of these archetypes, not a vague concept like growth or strategic positioning. While growth and strategic positioning may be important, they need to be translated into something tangible. Furthermore, even if your acquisition conforms to one of these archetypes, it still won't create value if you overpay.

Improve Target Company's Performance

Improving the performance of the target company is one of the most common value-creating acquisition strategies. Put simply, you buy a company and radically reduce costs to improve margins and cash flows. In some cases, the acquirer may also take steps to accelerate revenue growth.

Pursuing this strategy is what the best private-equity firms do. Acharya, Hahn, and Kehoe studied successful private-equity acquisitions where the target company was bought, improved, and sold with no additional acquisitions along the way.[13] They found that the operating profit margins of the acquired businesses increased by an average of about 2.5 percentage points more than at peer companies during the private-equity firm's ownership. That means many of the transactions increased operating profit margins even more.

Keep in mind that it is easier to improve the performance of a company with low margins and low return on invested capital (ROIC) than that of a high-margin, high-ROIC company. Consider the case of buying a company with a 6 percent operating profit margin. Reducing costs by three percentage points from 94 percent of revenues to 91 percent of revenues increases the margin to 9 percent and could lead to a 50 percent increase in the value of the company. In contrast, if the company's operating profit margin is 30 percent, increasing the company's value by 50 percent requires increasing the margin to 45 percent. Costs would need to decline from 70 percent of revenues to 55 percent, a 21 percent reduction in the cost base. That expectation might be unreasonable.

Consolidate to Remove Excess Industry Capacity

As industries mature, they typically develop excess capacity. For example, in chemicals, companies are constantly looking for ways to get more production out of their plants at the same time as new competitors (for example, Saudi Arabia in petrochemicals) continue to enter the industry. The combination of higher production from existing capacity with new capacity from new entrants often leads to more supply than demand. However, it is in no single competitor's interest to shut a plant. Companies often find it easier to shut plants across the larger combined entity resulting from an acquisition than, absent an acquisition, to shut their least productive plants and end up with a smaller company.

[13] V. V. Acharya, M. Hahn, and C. Kehoe, "Corporate Governance and Value Creation: Evidence from Private Equity" (working paper, Social Science Research Network, February 17, 2010).

Reducing excess capacity is not limited to shutting factories but can extend to less tangible forms of capacity. For example, consolidation in the pharmaceutical industry has significantly reduced sales force capacity as merged companies' portfolios of products have changed and they have rethought how to interact with doctors. The pharmaceutical companies have also significantly reduced their research and development capacity as they have found more productive ways to conduct research and pruned their portfolios of development projects.

While there is substantial value to be created from removing excess capacity, the bulk of the value nevertheless often accrues to the seller's shareholders, not the buyer's. In addition, all the other competitors in the industry may benefit from the capacity reduction without having to take any action of their own (the free-rider problem).

Accelerate Market Access for Target's (or Buyer's) Products

Often, relatively small companies with innovative products have difficulty accessing the entire potential market for their products. For instance, small pharmaceutical companies typically lack the large sales forces required to access the many doctors they need to see in order to promote their products. Larger pharmaceutical companies sometimes purchase these smaller companies and use their own large-scale sales forces to accelerate the sales growth of the smaller companies' products.

IBM has pursued this strategy in its software and services businesses. Between 2010 and 2013, IBM acquired 43 companies for an average of $350 million each. By pushing the products of these companies through IBM's global sales force, IBM estimated that it was able to substantially accelerate the acquired companies' revenues, sometimes by over 40 percent in the first two years after each acquisition.[14]

In some cases, the target can also help accelerate the acquirer's revenue growth. In Procter & Gamble's acquisition of Gillette, the combined company benefited because P&G had stronger sales in some emerging markets while Gillette had a bigger share of others. Working together, they were able to introduce their products into new markets much more quickly.

Acquire Skills or Technologies Faster or at Lower Cost Than by Building Them

Many technology-based companies buy other companies with technologies they need to enhance their own products. They do this because they can acquire the technology more quickly than developing it themselves, avoid royalty

[14]IBM Investor Briefing website, 2014.

payments on patented technologies, and keep the technology away from competitors. For example, Apple bought Siri (the automated personal assistant) in 2010 to enhance its iPhones. More recently, in 2014, Apple purchased Novauris Technologies, a speech recognition technology company, to further enhance Siri's capabilities. In 2014, Apple also purchased Beats Electronics, which had recently launched a music-streaming service. One reason for the acquisition was to quickly offer its customers a music-streaming service, as the market was moving away from Apple's iTunes business model of purchasing and downloading music.

Cisco Systems, the network product and services company (with $49 billion in revenue in 2013), used acquisitions of key technologies to assemble a broad line of network solution products during the frenzied Internet growth period. From 1993 to 2001, Cisco acquired 71 companies at an average price of approximately $350 million each, helping it to increase revenues from $650 million in 1993 to $22 billion in 2001, with nearly 40 percent of its 2001 revenues coming directly from these acquisitions.

Exploit a Business's Industry-Specific Scalability

Economies of scale are often cited as a key source of value creation in M&A. While they can be, you have to be very careful in justifying an acquisition by economies of scale, especially for large acquisitions. That's because often large companies are already operating at scale. If two large companies are already operating in that way, combining them will not likely lead to lower unit costs. Take UPS and FedEx, for example. They already have some of the largest airline fleets in the world and operate them very efficiently. If they were to combine (probably not possible due to antitrust regulations), it's unlikely that there would be substantial savings in their flight operations.

Economies of scale can be important sources of value in acquisitions when the unit of incremental capacity is large or when a larger company buys a subscale company. For example, the cost to develop a new car platform is enormous, so auto companies try to minimize the number of platforms they need. The combination of VW, Audi, and Porsche allows all three companies to share some platforms. For example, the VW Toureg, Audi Q7, and Porsche Cayenne are all based on the same underlying platform.

Some economies of scale are found in purchasing, especially when there are a small number of buyers in a market with differentiated products. An example is the market for television programming in the United States. Only a handful of cable companies, satellite television companies, and telephone companies purchase all the television programming. As a result, the largest purchasers have substantial bargaining power and can achieve the lowest prices. One of the key benefits of AT&T's proposed purchase of DirecTV (under review by the U.S. government at the time of this writing) is the ability for the company to negotiate lower prices for television programming.

While economies of scale can be a significant source of acquisition value creation, rarely are generic economies of scale, like back-office savings, significant enough to justify an acquisition. Economies of scale must be unique to be large enough to justify an acquisition.

Pick Winners Early and Help Them Develop Their Businesses

The final winning acquisition strategy involves making acquisitions early in the life cycle of a new industry or product line, long before most others recognize that the industry will grow to a large size. Johnson & Johnson (J&J) pursued this strategy in its early acquisitions of medical-device businesses. J&J purchased orthopedic-device manufacturer DePuy in 1998, when DePuy had $900 million of revenues. By 2010, DePuy's revenues had grown to $5.6 billion, an annual growth rate of about 17 percent. (In 2011, J&J purchased Synthes, another orthopedic-device manufacturer, so more recent revenue numbers are not comparable.)

This acquisition strategy requires managers to take a disciplined approach in three dimensions. First, you need to be willing to make investments early, long before your competitors and the market see the industry's or company's potential. Second, you need to make multiple bets and expect some to fail. Third, you need to have the skills and patience to nurture the acquired businesses.

MORE DIFFICULT STRATEGIES FOR CREATING VALUE FROM ACQUISITIONS

Beyond the six main acquisition archetypes just described, a handful of others can create value. However, these are more difficult to execute successfully.

Roll-Up Strategy

Roll-up strategies are used to consolidate highly fragmented markets, where the current competitors are too small to achieve scale economies. An example is Service Corporation International's roll-up of the U.S. funeral business. Beginning in the 1960s, Service Corporation grew from one funeral home in Houston, Texas, to over 1,400 funeral homes and cemeteries in 2008. Similarly, Clear Channel rolled up the radio station market in the United States, eventually owning more than 900 stations.

The strategy works when the businesses as a group can realize substantial cost savings or achieve higher revenues than the individual businesses. For example, Service Corporation's funeral homes in a single city can share vehicles, purchasing, and back-office operations. They can also coordinate advertising across a city to reduce costs and realize higher revenues.

Size per se is not what creates a successful roll-up. What matters is the right kind of size. For example, for Service Corporation, having multiple locations in the same city has been more important than simply having many branches spread over many cities, because the cost savings, such as sharing vehicles, can be realized only if the branches are near one another.

Because roll-up strategies are hard to disguise, they invite copycats. As others tried to copy Service Corporation's strategy, prices for some funeral homes were eventually bid up to levels that made additional acquisitions uneconomic.

Consolidate to Improve Competitive Behavior

Many executives in highly competitive industries hope consolidation will lead competitors to focus less on price competition, thereby improving the industry's ROIC. However, the evidence shows that unless an industry consolidates down to just three or four competitors and can keep entrants out, competitor pricing behavior does not change: there's often an incentive for smaller companies or new entrants to gain share through price competition. So in an industry with 10 competitors, lots of deals must be completed before the basis of competition changes.

Enter into a Transformational Merger

A commonly mentioned reason for an acquisition or merger is to transform one or both companies. Transformational mergers are rare, however, because the circumstances have to be just right, and the management team needs to execute the strategy well. The best way to describe a transformational merger is by example. One of the world's leading pharmaceutical companies, Novartis of Switzerland, was formed by the $30 billion merger of Sandoz and Ciba-Geigy, announced in 1996. But this merger was much more than a simple combination of businesses: Under the leadership of the new CEO, Daniel Vasella, Sandoz and Ciba-Geigy were transformed into an entirely new company. Using the merger as a catalyst for change, Vasella and his management team not only captured $1.4 billion in cost synergies but also redefined the company's mission and strategy, portfolio and organization, and all key processes from research to sales. In all areas, there was no automatic choice for either the Ciba or the Sandoz way of doing things; instead, a systematic effort was made to find the *best* way of doing things.

Novartis shifted its strategic focus to innovation in its life sciences business (pharmaceuticals, nutrition, and agricultural) and spun off the $7 billion Ciba Specialty Chemicals business in 1997. Organizational changes included reorganizing research and development worldwide by therapeutic rather than geographic area, enabling Novartis to build up a world-leading oncology franchise. Across all departments and management layers, Novartis created a strong performance-oriented culture, supported by a change from a seniority-based to a performance-based compensation system for its managers.

Buy Cheap

The final way to create value from an acquisition is to buy cheap—in other words, at a price below the target's intrinsic value. In our experience, however, opportunities to create value by buying cheap are rare and relatively small.

Although market values revert to intrinsic values over longer periods, there can be brief moments when the two fall out of alignment. Markets sometimes overreact to negative news, such as the criminal investigation of an executive or the failure of a single product in a portfolio of many strong products. Such moments are less rare in cyclical industries, where assets are often undervalued at the bottom of the cycle. Comparing actual market valuations with intrinsic values based on a "perfect foresight" model, we found that companies in cyclical industries could more than double shareholder returns (relative to actual returns) if they acquired assets at the bottom of a cycle and sold at the top.[15]

However, while markets do provide occasional opportunities for companies to buy below intrinsic value, we haven't seen many cases. To gain control of the target, the acquirer must pay the target's shareholders a premium over the current market value. Although premiums can vary widely, the average premiums for corporate control have been fairly stable, near 30 percent of the preannouncement price of the target's equity.

For targets pursued by multiple acquirers, the premium rises dramatically, creating the so-called winner's curse. If several companies evaluate a given target and all identify roughly the same synergies, the one who overestimates potential synergies the most will offer the highest price. Since the offer price is based on an overestimate of value to be created, the supposed winner overpays—and is ultimately a loser.[16] A related problem is hubris, or the tendency of the acquirer's management to overstate its ability to capture performance improvements from the acquisition.[17]

Since market values can sometimes deviate from intrinsic values, management must also be wary of the possibility that markets may be overvaluing a potential acquisition. Consider the stock market bubble during the late 1990s. Companies that merged with or acquired technology, media, and telecommunications companies saw their share prices plummet when the market reverted to earlier levels. Overpaying when the market is inflated is a serious concern

[15] T. Koller and M. de Heer, "Valuing Cyclical Companies," *McKinsey Quarterly*, no. 2 (2000): 62–69.
[16] K. Rock, "Why New Issues Are Underpriced," *Journal of Financial Economics* 15 (1986): 187–212.
[17] R. Roll, "The Hubris Hypothesis of Corporate Takeovers," *Journal of Business* 59 (1986): 197–216.

because M&A activity seems to rise following periods of strong market performance. If (and when) prices are artificially high, large improvements are necessary to justify an acquisition, even when the target can be purchased at no premium to market value.

ESTIMATING OPERATING IMPROVEMENTS

As we've been discussing, the main sources of value created through M&A are the cost, capital, and revenue improvements, often referred to as synergies, that the combined company makes. Rarely does a simple cheap purchase price make the same sort of difference. So estimating the potential improvements is one of the most important success factors for M&A (along with executing on those improvements once the deal is completed).

Before getting into to the estimation, it's worth emphasizing that estimating improvements from combining corporate entities is not a one-time event. It's done multiple times: first, before negotiations even begin; second, during negotiations, as the acquirer gets more information; and finally, after the deal closes. Some companies give short shrift to the last step, but it is critical. Some of our colleagues found that almost 50 percent of the time, pre-closing estimates failed to provide an adequate road map for fully identifying improvement opportunities.[18]

We find that companies do a much better job of realizing cost savings than revenue improvements. McKinsey's Merger Management Practice analyzed 90 acquisitions and found that 86 percent of the acquirers were able to capture at least 70 percent of the estimated cost savings.[19] In contrast, almost half of the acquirers realized *less* than 70 percent of the targeted revenue improvements, and in almost one-quarter of the observed acquisitions, the acquirer realized less than 30 percent of the targeted revenue improvements.

Estimating Cost and Capital Savings

Too often, managers estimate cost savings simply by calculating the difference in financial performance between the bidder and the target. Having an earnings before interest, taxes, and amortization (EBITA) margin 200 basis points higher than the target, however, will not necessarily translate into better performance for the target. There are no easy rules of thumb in estimating cost and capital savings. The best estimates are based on detailed analysis. Cost and capital reduction should follow a systematic process: estimating a

[18]O. Engert and R. Rosiello, "Opening the Aperture 1: A McKinsey Perspective on Value Creation and Synergies" (McKinsey working paper).
[19]S. A. Christofferson, R. S. McNish, and D. L. Sias, "Where Mergers Go Wrong," *McKinsey Quarterly*, no. 2 (2004): 93–99.

EXHIBIT 27.7 **Sample Framework for Estimating Cost Savings**

Function	Example savings
Research and development	• Stopping redundant projects • Eliminating overlap in research personnel • Developing new products through transferred technology
Procurement	• Pooled purchasing • Standardizing products
Manufacturing	• Eliminating overcapacity • Transferring best operating practices
Sales and marketing	• Cross-selling products • Using common channels • Transferring best practices • Lowering combined marketing budget
Distribution	• Consolidating warehouses and truck routes
Administration	• Exploiting economies of scale in finance/accounting and other back-office functions • Consolidating strategy and leadership functions

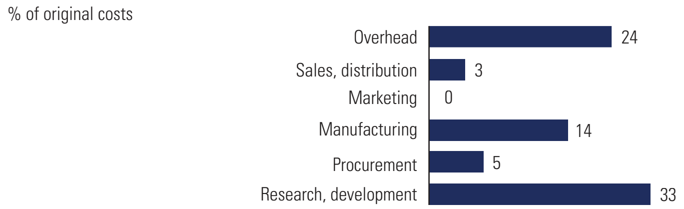
baseline, estimating savings for each category, and testing the results against benchmarks.

Begin with a detailed baseline for cost and capital as if the two companies remained independent across the different parts of the companies' cost structures. The purpose of the baseline is to ensure that all costs of both the acquirer and target are accounted for and that you don't run the risk of double-counting when you estimate savings. Make sure the baseline costs and capital requirements are consistent with the intrinsic valuations.

Now you can systematically estimate the potential cost and capital savings for each cost category of both the acquirer and the target. While there are some typical types of savings, as Exhibit 27.7 shows, you should ensure that the cost categories and savings ideas are tailored to the company and industry. For an accurate estimate of potential savings, tie the savings explicitly to operational activities in the business. For example, what is the equivalent head count reduction of cost savings in selling, general, and administrative (SG&A) expense? What is the resulting revenue per head count? How much will distribution costs fall when trucks are fully loaded, rather than partially loaded? Are revenues sufficient to guarantee fully loaded trucks?

When tying savings to operational drivers, involve experienced line managers in the process. An integrated team that includes both financial analysts and experienced line managers is more likely to be accurate than a pure finance team is. In addition, experienced line managers often will already know details

EXHIBIT 27.8 **Automotive Merger: Estimating Cost Savings**



about the target. If so, you will generate insights on capacity, quality issues, and unit sales not easily found in the public domain.

Consider one acquisition, where the head of operations took the lead in estimating the savings from rationalizing manufacturing capacity, distribution networks, and suppliers.[20] His in-depth knowledge about the unusual manufacturing requirements for a key product line and looming investment needs at the target's main plant substantially improved savings estimates. In addition, this manager conducted a due-diligence interview with the target's head of operations, learning that the target did not have an enterprise resource planning (ERP) system. Each of these facts improved negotiations and deal structuring, for example, by permitting management to promise that the target's main European location would be retained while maintaining flexibility about the target's main U.S. facility. Moreover, the involvement of the operations manager ensured that the company was prepared to act quickly and decisively to capture savings following the deal's closure.

After you complete the assessment, always compare the aggregate results for the combined companies with industry benchmarks for operating margins and capital efficiency. Ask whether the resulting ROIC and growth projections make sense given the overall expected economics of the industry. Only a fully developed integrated income statement and balance sheet will ensure that savings estimates are in line with economic reality. In particular, ensure that the ROIC for the new combination lands at the right level for the continuing value and is in line with the underlying competitive structure of the industry. The more difficult it is to sustain a competitive advantage, the more you need to scale down the performance improvements over the longer term.

You'll also find that the potential cost savings vary widely by cost category. Exhibit 27.8 presents the cost savings by category for an automotive-industry acquisition. While the overall estimated cost savings for the automotive acquisition were about 10 percent of total combined costs, the savings varied considerably across category. For example, although procurement costs are the single largest cost category for automotive manufacturers, most companies already

[20]This and other examples can be found in Christofferson et al., "Where Mergers Go Wrong."

have the necessary scale to negotiate favorable contracts. Therefore, savings from procurement were estimated at only 5 percent. In contrast, research and development reductions were estimated at 33 percent, as the two companies consolidated new-product development, paring down the number of expected offerings. This reduction also had a follow-on effect in manufacturing, as product designs would move toward a common platform, lowering overall manufacturing costs. Finally, while sales and distribution expenses could be lowered, management decided to preserve the combined company's marketing budget.

Estimating Revenue Improvements

Although it is tempting to assume that revenues for the newly combined company will equal stand-alone sales plus new cross-selling, the reality is often quite different. First, the merger often disrupts existing customer relationships, leading to a loss of business. Also, smart competitors use mergers as a prime opportunity to recruit star salespeople and product specialists. Some customers may have used the acquirer and target as dual sources, so they will move part of their business to another company to maintain a minimum of two suppliers. Finally, customers who decide to stay during the merger will not be shy in asking for price and other concessions that salespeople will be eager to offer, for fear of losing the business.

Make sure to develop estimates of pricing power and market share that are consistent with market growth and competitive reality. As in the process for estimating cost savings, calibrate the pro forma assumptions against the realities of the marketplace. One global financial company estimated that an acquisition would net €1 billion in sales improvements within the next five years, including double-digit profit growth in the first year. However, overall market growth was limited, so the only way to achieve these sales goals was to lower prices. Actual profit growth was a mere 2 percent.

When estimating revenue improvements, be explicit about where any growth in revenues beyond base-case assessments is expected to originate. Revenue improvements will typically come from one or more of four sources:

1. Increasing each product's peak sales level
2. Reaching the increased peak sales faster
3. Extending each product's life
4. Adding new products (or features) that could not have been developed if the two companies had remained independent

Alternatively, revenue increases could come from higher prices, achievable because the acquisition reduces competition. In reality, however, antitrust regulations are in place precisely to prevent companies from using this lever, which would transfer value from customers to shareholders. Instead, any increase in price must be directly attributable to an increase in value to the customer and not to reduced choice.

We also suggest you project revenue improvements in absolute amounts per year or as a percentage of stand-alone revenues, rather than as an increase in the revenue growth rate. With the growth rate approach, you can easily overestimate the true impact of revenue improvements.

Implementation Costs and Timing

Although performance improvements often result from doing more with less, making a change or combining systems always involves some costs. Some are obvious, such as the costs to decommission a plant and the severance that must be paid to employees. Others are more subtle, such as rebranding campaigns when the name of the target is changed, integration costs for different information technology (IT) systems, and the retraining of employees. But these costs, often forgotten, must also be identified and estimated. It is not unusual for total implementation costs to be equivalent to a full year of cost savings or more.

Bear in mind that acquirers often make overly optimistic assumptions about how long it will take to capture improvements. Reality intervenes in many ways: ensuring stable supplies to customers while closing a plant can be more complicated than the acquirer expects, disparate customer lists from multiple sources can be tricky to integrate, and examining thousands of line items in the purchasing database almost always takes more hours than estimated, just to name a few possibilities.

Moreover, timing problems can affect whether the improvements are captured at all. Our experience suggests that improvements not captured within the first full budget year after consolidation may never be captured, as the drive to capture them is overtaken by subsequent events. Persistent management attention matters.

Neglecting the "use by" date of certain savings can be equally problematic. Many potential savings do not stay on the table forever. For example, one source of cost savings is eliminating cyclical excess capacity in a growing industry. But in these circumstances, the excess capacity will eventually be eliminated through natural growth. Thus, reducing capacity can achieve *incremental* savings only if the reduction comes during the expected duration of any capacity overhang.

HOW TO PAY: IN CASH OR IN STOCK?

Should the acquiring company pay in cash or in shares? Research shows that, on average, an acquirer's stock returns surrounding the acquisition announcement are higher when the acquirer offers cash than when it offers shares. We

EXHIBIT 27.9 **Paying with Cash vs. Stock: Impact on Value**

Value to shareholders after transaction, $ million

Market value before deal	
Acquirer	1,000
Target	500
Price paid (30% premium)	650
Ownership ratio (stock deal)	39.4%/60.6%

	Downside scenario (Synergies = 100)	**Upside scenario** (Synergies = 200)
Consideration in cash		
Combined value	1,600	1,700
Price paid	(650)	(650)
Value of acquirer postdeal	950	1,050
Target value created (destroyed)	150	150
Value of acquirer predeal	(1,000)	(1,000)
Acquirer value created (destroyed)	(50)	50
Consideration in stock		
Combined value	1,600	1,700
Target's share (39.4%)	(630)	(670)
Value of acquirer postdeal	970	1,020
Target value created (destroyed)	130	170
Value of acquirer predeal	(1,000)	(1,000)
Acquirer value created (destroyed)	(30)	30

hesitate, however, to draw a conclusion based solely on aggregate statistics; after all, even companies that offer cash can pay too much.

Assuming that the acquirer is not capital constrained, the real issue is whether the risks and rewards of the deal should be shared with the target's shareholders. When the acquiring company pays in cash, its shareholders carry the entire risk of capturing synergies and paying too much. If the companies exchange shares, the target's shareholders assume a portion of the risk.

Exhibit 27.9 outlines the impact on value of paying in cash rather than shares for a hypothetical transaction. Assume that the acquirer and the target have a market capitalization of $1 billion and $500 million, respectively. The acquirer pays a total price of $650 million, including a premium of 30 percent. We calculate the estimated discounted-cash-flow (DCF) values after the transaction under two scenarios: (1) a downside scenario in which the value of operating improvements is $50 million lower than the premium paid, and (2) an upside scenario in which the value of these improvements is $50 million higher. (To simplify, we assume that market value equals intrinsic value for both the target and the acquirer.)

If the payment is entirely in cash, the target's shareholders get $650 million, regardless of whether the improvements are high enough to justify the premium. These shareholders do not share in the implementation risk. The acquirer's shareholders see the value of their stake increase by $50 million in the upside case and decrease by the same amount in the downside case. They carry the full risk.

Next, consider the same transaction paid for in shares. The target's shareholders participate in the implementation risk by virtue of being shareholders in the new combined entity.[21] In the upside case, their payout from the acquisition increases as improvements increase: they receive $670 million in value, as opposed to $650 million. Effectively, even more value has been transferred from the acquirer's shareholders to the target's shareholders. The acquirer's shareholders are willing to allow this form of payment, however, because they are protected if implementation goes poorly. If the deal destroys value, the target's shareholders now get less than before, but still a nice premium, since their portion of the combined company is worth $630 million, compared with the $500 million market value before the deal.

From this perspective, two key issues should influence your choice of payment: First, do you think the target, and/or your company, is overvalued or undervalued? During a bubble, you will be more inclined to pay in shares, as everybody will then share the burden of the market correction. In such a scenario, develop a perspective on relative overvaluation of the two businesses. If you believe your shares are more overvalued than the target's, they are valuable in their own right as transaction currency.[22] Second, how confident are you are in the ability of the deal to create value overall? The more confident you are, the more you should be inclined to pay in cash.

When weighing whether to pay in cash or in shares, you should also consider what your optimal capital structure will be. Can your company raise enough cash through a debt offering to pay for the target entirely in cash? Overextending credit lines to acquire a company can devastate the borrower. One company, an automotive supplier, borrowed cash to pay for a string of acquisitions. Operating improvements did not materialize as originally expected (partly because execution of the post-merger plan was not rigorous), and the company ended up with a debt burden that it could not bear, leading to bankruptcy.

If the capital structure of the combined entity cannot accommodate any extra debt incurred by paying cash for the acquisition, then you need to consider paying partially or fully in shares, regardless of any desire to share risk among the shareholders of the new entity.

[21] Target shareholders with small stakes can sell their shares in the public market to avoid implementation risk. Influential shareholders with large stakes, such as company founders and senior executives, will often agree not to sell shares for a specified period. In this case, they share the risk of implementation.

[22] The signaling effect of a share consideration is similar to that of share issuance. The capital markets will use this new information (that the shares might be overvalued) when pricing the shares.

FOCUS ON VALUE CREATION, NOT ACCOUNTING

Many managers focus on the accretion and dilution of earnings brought about by an acquisition, rather than the value it could create. They do so despite numerous studies showing that stock markets pay no attention to the effects of an acquisition on accounting numbers, but react only to the value that the deal is estimated to create. Focusing on accounting measures is therefore dangerous and can easily lead to poor decisions.

By 2005, both International Financial Reporting Standards (IFRS) and U.S. Generally Accepted Accounting Principles (GAAP) had eliminated amortization of goodwill. Overnight, most acquisitions that would have been dilutive to earnings per share (EPS) were now accretive. In cash deals, the only dilution is from additional interest expense, which after tax is typically less than 4 percent of the deal value. In the case of share deals, the deal is accretive if the acquirer's P/E is higher than the target's.

But changing accounting doesn't change the economics of the deals. Many acquisitions are earnings accretive but destroy value. Consider the hypothetical deal in Exhibit 27.10. You are deciding whether to purchase a company currently priced in the market at $400 million for $500 million in cash. Your company, the acquirer, is worth $1.6 billion and has a net income of $80 million. For simplicity, assume there are no operating improvements to come from the deal. You decide to finance this deal by raising debt at a pretax interest rate of 6 percent. This deal destroys value: you overpay by $100 million (remember, no improvements). Even so, next year's earnings and earnings per share (EPS) actually increase because the after-tax earnings from the acquired company ($30 million) exceed the after-tax interest required for the new debt ($19.5 million).

EXHIBIT 27.10 **EPS Accretion with Value Destruction**

Assumptions	Acquirer	Target
Net income, $ million	80.0	30.0
Shares outstanding, million	40.0	10.0
EPS, $	2.0	3.0
Preannouncement share price, $	40.0	40.0
Price-to-earnings ratio	20.0	13.3
Market value, $ million	1,600.0	400.0
Price paid, $ million	–	500.0

Impact on EPS	Cash deal	Stock deal
Net income, $ million		
Net income from acquirer	80.0	80.0
Net income from target	30.0	30.0
Additional interest[1]	(19.5)	–
Net income after acquisition	90.5	110.0
Number of shares, million		
Original shares	40.0	40.0
New shares	–	12.5
Number of shares	40.0	52.5
Earnings per share, $		
EPS before acquisition	2.00	2.00
EPS accretion	0.26	0.10
EPS after acquisition	2.26	2.10

[1] Pretax cost of debt at 6%, tax rate of 35%.

How can a deal increase earnings yet destroy value? The acquirer is borrowing 100 percent of the deal value based on the combined cash flows of both companies. But the acquired business could not sustain this level of debt on its own. Since the acquirer puts an increased debt burden on the existing shareholders without properly compensating them for the additional risk, it is destroying value. Only when the ROIC (calculated as target profits plus improvements divided by the total purchase price) is greater than the weighted average cost of capital are shareholders appropriately compensated. In our hypothetical deal, the investment is $500 million, and the after-tax profit is $30 million—a mere 6 percent return on invested capital. While this is above the after-tax cost of financing the debt of 3.9 percent, it is below the weighted average cost of capital.

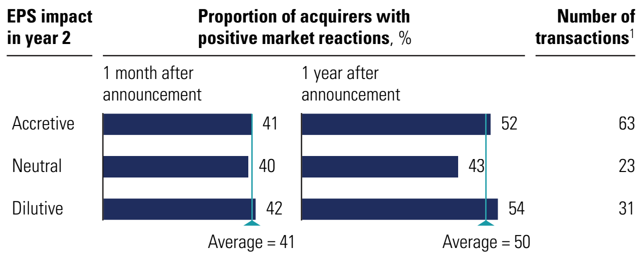
Now suppose the same target is acquired through an exchange of shares. The acquirer would need to issue 12.5 million new shares to provide the 25 percent acquisition premium that the target company's shareholders demand.[23] After the deal, the combined company would have 52.5 million shares outstanding and earnings of $110 million. The earnings per share for the new company rise to $2.10, so the deal is again accretive without having created any underlying value. The new EPS is merely the weighted average of the two companies' EPS values, so the increase is a result of mathematics rather than value created by the deal.

Conversely, companies sometimes pass up acquisitions that can create value just because they are earnings dilutive in the first several years. Suppose you spend $100 million to buy a fast-growing company in an attractive market, with a P/E of 30 times. Before performance improvements, the earnings from the acquisition will be $3.3 million. If you borrowed at 4 percent after tax, interest expense would be $4.0 million, leading to earnings dilution of $0.7 million. However, if you are able to accelerate the target's growth rate to 20 percent for the next five years and the target earns a 25 percent return on capital, it will probably create value for shareholders, even though the earnings and ROIC will be depressed for a couple of years.

Financial markets understand the difference between creating real value and increasing EPS. In a study of 117 U.S. transactions larger than $3 billion that took place in 1999 and 2000, we found that earnings accretion or dilution resulting from the deals was not a factor in the market's reaction to the deals (see Exhibit 27.11). Regardless of whether the expected EPS was greater, smaller, or the same two years after the deal, the market's reaction was similar at one month after the announcement and one year after the announcement (within the bounds of statistical significance).

[23]The exchange ratio in this hypothetical deal is 1.25 shares of the acquiring company for each share of the target company. We assume that the capital market does not penalize the acquirer and that the exchange ratio can be set in relation to the preannouncement share price plus the 25 percent acquisition premium.

EXHIBIT 27.11 **Market Reaction to EPS Impact of Acquisitions**



[1] The sample set included 117 transactions greater than $3 billion by U.S. companies between January 1999 and December 2000.

Note: The difference in returns between accretive and dilutive is not statistically significant. Returns were risk-adjusted using the capital asset pricing model (CAPM).
Source: Thomson, analyst reports, Compustat.

CHARACTERISTICS OF BETTER ACQUIRERS

This chapter ends with some observations about the characteristics of companies that are better acquirers. Companies are more successful at M&A when they apply the same focus, consistency, and professionalism to it as they do to other critical disciplines.[24] This requires building four often-neglected institutional capabilities: engaging in M&A thematically, managing their reputation as an acquirer, confirming their strategic vision, and managing performance improvement targets across the M&A life cycle.

Engaging in M&A Thematically

Successful companies develop a pipeline of potential acquisitions around two or three explicit M&A themes that support the corporate strategy. These themes are effectively business plans that utilize both M&A and organic investments to meet a specific objective while explicitly considering an organization's capabilities and its characteristics as the best owner of a business. Priority themes are those where the company needs M&A to deliver its strategy and have the ability to add value to targets. They are also highly detailed, and their effect is measurable in market share, customer segment, or product development goals.

Consider, for example, a global retail company's M&A theme: to grow through entry into two emerging markets by acquiring only local companies that are unprofitable yet in the top three of their market. That's a level of specificity few companies approach. To get there, managers started with the company's strategic goal: to become the third largest player in its sector within five years, something it could achieve only by aggressively entering emerging markets. A less disciplined company might have accepted the strategic goal

[24] Adapted from C. Ferrer, R. Uhlaner, and A. West, "M&A as a Competitive Advantage," *McKinsey on Finance*, no. 47 (Summer 2013): 2–5.

as its M&A objective and moved on to a broad scan for targets. But managers at the retail company refined their M&A goals further. They concluded that trying to enter too many markets at once was impractical, due to constraints on management time and the complexities of entering new geographies, so they limited their search to the two most promising regions. They also knew their lean operations would offer cost performance improvements in companies with bloated operations—especially given the importance of economies of scale in the industry—and that local branding and catering to local preferences were critical. With their M&A theme defined so precisely, managers were able to narrow the list of potential candidates to a handful of companies.

Managing Reputation as an Acquirer

Few companies consider how they are perceived by targets or how their value proposition as an acquirer compares with that of their competitors. Many are too slow and reactive at identifying potential acquisition targets, too timid in courting and building relationships with them, or too tactical when initiating conversations. They may have such broad goals that they can't proactively approach a list of potential targets.

In our observation, companies that invest in their reputation as acquirers are perceived as bold, focused on collaboration, and able to provide real mentorship and distinctive capabilities for the target. Even some of the largest and most complex organizations are perceived as attractive buyers by small and nimble targets, largely due to the way they present themselves and manage M&A. The best among them tend to lead with deep industry insight and a business case that is practical and focused on winning in a marketplace. They let target-company managers see how they can be successful in the new organization, typically by enabling the aggressive growth vision of the smaller company. They also have scalable functions and a predictable, transparent M&A process that targets can easily navigate. As a result, they are able to use their position in the market to succeed in dimensions that go beyond price—and are often approached by targets that aren't even yet for sale. This is a real competitive advantage, as the best assets migrate to the companies they perceive will add value, and this decreases search time, complexity of integration, and the chances of a bidding war.

At one high-tech company, for example, these concepts came together around the theme of enabling innovation. The company's investment in its reputation as an acquirer started with an external marketing campaign but quickly made its way deep into the M&A process. In discussions at conferences and in engineering communities, managers used testimonials from acquired employees to underscore their track record at buying companies and providing them with the expertise and resources they need to accelerate their product pipelines. They developed useful personal relationships with target-company executives by discussing ways to work together even beyond the context of a deal (or instead of a deal). And when it came time to present integration plans and future investment models to targets, managers made sure the proposals were consistent with the acquiring company's reputation.

Confirming the Strategic Vision

For many companies, the link between strategy and a transaction breaks down during due diligence. By focusing strictly on financial, legal, tax, and operations issues, the typical due diligence fails to bring in data critical to testing whether the strategic vision for the deal is valid.

To underpin the strategic impulse behind the deal, companies should bolster the usual financial due diligence with strategic due diligence, testing the value creation rationale for a deal against the more detailed information available to them after signing the letter of intent—as well as seeing whether their vision of the future operating model is actually achievable. A strategic due diligence should explicitly confirm the assets, capabilities, and relationships that make a buyer the best owner of a specific target company. It should bolster an executive team's confidence that they are truly an advantaged buyer of an asset.

It is critical for executives to be honest and thorough when assessing their advantages. Ideally, they develop a fact-based point of view on their beliefs—testing them with anyone responsible for delivering value from the deal, including salespeople, R&D engineers, and their human resources and finance departments. Such an approach would have helped one large financial company. Due diligence for the deal focused on auditing existing operations rather than testing the viability of the future operating models. The advantaged-buyer criteria assumed by the company focused on being one of the most effective operators in the industry, supported by strong IT systems and processes. Executives proceeded with the deal without ever learning that the IT team had a different picture of the eventual end state, and they learned only after close that the two companies' IT systems could not be integrated.

Reassessing Performance Improvement Targets

Failing to update expectations on performance improvements as the buyer learns more about the target during integration is one of the most common but avoidable pitfalls in any transaction. Companies that treat M&A as a project typically build and secure approval for a company's valuation only once, during due diligence, and then build these targets into operating budgets. This forces the organization's aspirations down to the lowest common denominator by freezing expectations at a time when information is uncertain and rarely correlated with the real potential of a deal.

Managing this challenge can be complex but worthwhile. One consumer packaged-goods company boosted run-rate synergies by 75 percent after managers recognized that the target's superior approach to in-store promotions could be used to improve its base business. A pharmaceutical company raised its synergies by over 40 percent in a very large transaction by actively revisiting estimates immediately after the deal closed, creating a risk-free environment for managers to come up with new ideas. A few years later, it had captured those higher synergies.

Companies can employ a number of tactical activities to build a real capability at realizing synergies. They might, for example, bring stakeholders together in so-called value creation summits that mimic the intensity and focus of a due-diligence effort but change the incentives to focus on the upside. And we've seen experienced acquirers take a blank-sheet approach to foster creativity, rather than anchor the exercise in a financial due-diligence model, which often leads to incremental synergies. These and similar activities allow companies to reinforce the idea that due-diligence estimates of performance improvements are the lowest acceptable performance—and get managers used to setting their sights higher.

SUMMARY

Acquisitions are good for the economy when they allocate resources more efficiently between owners. However, most acquisitions create more value for the shareholders of the target company than for those of the buyer and many destroy value for the buyer's shareholders. This is perhaps not surprising when we recall that acquisitions can create value for acquirers only if the target company's performance improves by more than the value of the premium over the target's intrinsic value that the acquirer had to offer for the target in order to persuade its shareholders to part with it.

Managers can help to ensure that their acquisitions are among those that create value for their shareholders by choosing one of the limited number of acquisition archetypes that have created value for acquirers in the past. Success also depends critically on making realistic estimates of the cost and revenue improvements that the target company can realize under new ownership, taking into account the often-substantial cost of implementing those improvements.

Managers should bear in mind that stock markets are interested only in the impact of acquisitions on the intrinsic value of the combined company. Whether an acquisition will increase or decrease earnings per share in the short term has no effect on the direction and extent of movements in the buyer's share price following the acquisition announcement.

Finally, the best acquirers build systematic institutional skills in defining their M&A strategy, managing their reputation as an acquirer, and consistently looking for performance improvement opportunities beyond those estimated before the deal was complete.

28

Divestitures*

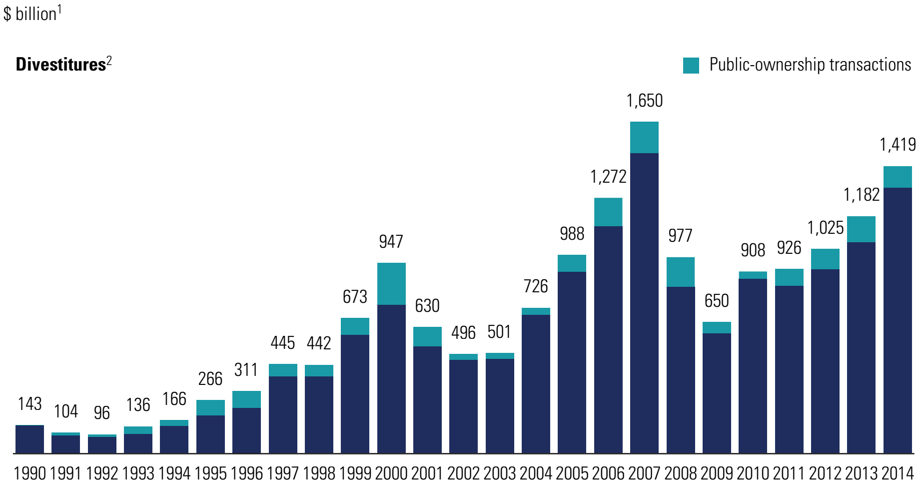
As described in Chapter 25, any program to create value should include systematically reviewing your portfolio of businesses. Our analyses of the largest global exchange-listed companies show that those that endure in the top ranks combine their mergers and acquisitions (M&A) programs with selected divestitures. But as noted, many executives still shy away from actively pursuing divestitures as part of a value-creation program.

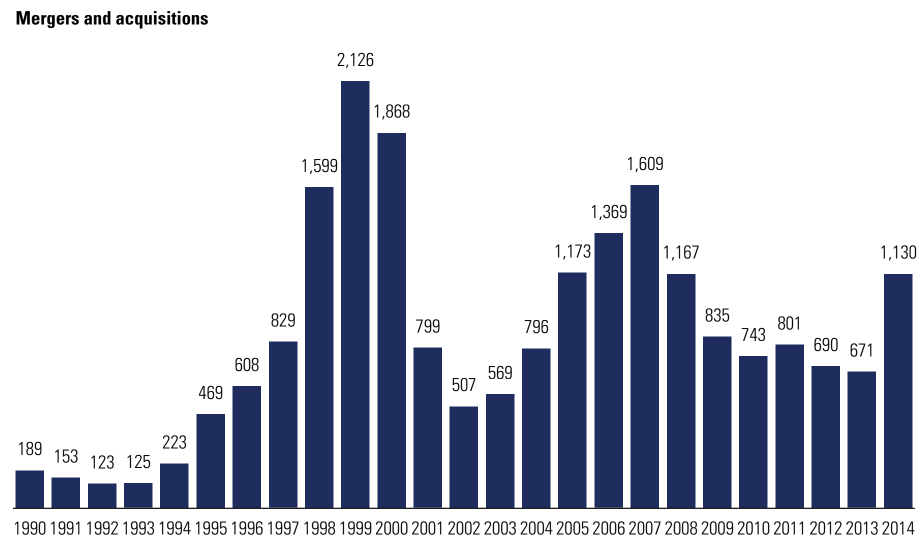
Divestitures, like mergers and acquisitions, tend to occur in waves. In the decade following the conglomerate excesses of the 1960s and 1970s, many companies refocused their portfolios. These divestitures were generally sales to other companies or private buyout firms. Exhibit 28.1 shows that the divestiture wave of the late 1990s included more public-ownership transactions—spin-offs, carve-outs, and tracking stocks—and that such public-ownership transactions have become an established divestment approach, although the majority of divestitures are still deals between companies.

Evidence shows that divestitures lead to higher shareholder returns in the short term around their announcement, as well as in the years following the divestiture. Companies employing a balanced portfolio approach to acquisitions and divestitures outperform companies that rarely divest. Successful companies also divest businesses that are performing well but could do even better under different ownership. For example, Germany-based Siemens has for several years been pursuing a theme of profitable growth, including major portfolio initiatives. As part of this program, Siemens put its telecommunication carrier business into a 50–50 joint venture with Nokia in 2006. A year later, it sold its Siemens VDO business (supplying parts and components, as well as software, to carmakers) to Continental. In 2013, it also spun off its OSRAM lighting division. The three divested businesses had contributed about 35 percent of Siemens's sales in 2005. These transactions reflected a significant change

*Special thanks to André Annema for coauthoring this chapter.

EXHIBIT 28.1 **Divestiture Volume vs. M&A Volume**





[1] Transactions with deal value above $50 million. Deals involving U.S. or European target and/or acquirer.
[2] Divestitures include sales of equity stakes greater than 50%, asset sales, and public-ownership transactions (spin-offs, carve-outs, split-offs).

Source: Securities Data Company, Dealogic.

in the group's portfolio orientation, but one that the company thought was needed in order to shift its focus onto the more attractive parts of its portfolio. Siemens demonstrated that it earmarks not only underperforming businesses for divestment but also other businesses that no longer fit well with its corporate strategy.

However, many divestitures still occur not as an expression of a strategic impulse but in reaction to pressure from outside the corporation. For example,

EXHIBIT 28.2 **Market-Adjusted Announcement Returns of Divestitures**

Cumulative abnormal returns measured from 1 day before to 1 day after announcement.

	All	Spin-offs	Carve-outs	Asset sales
Mean, %	3.0	4.5	2.3	2.6
Median, %	1.8	3.6	0.9	1.6
Number of transactions	370	106	125	139

Source: J. Mulherin and A. Boone, "Comparing Acquisitions and Divestitures," *Journal of Corporate Finance* 6 (2000): 117–139.

in September 2013, Timken announced the spin-off of its steel business after an activist-investor campaign. Similarly, in 2014, PepsiCo faced pressure from an activist investor to separate its beverages and food businesses.

This chapter first presents the evidence that divestitures create value and the factors that go into creating that value. Then it discusses why executives often shy away from proactively pursuing divestitures, in spite of this evidence. The next section shows how to assess a divestiture's value-creation potential. The final section provides some guidance on how to choose the specific type of transaction for a divestiture.

VALUE CREATION FROM DIVESTITURES

Academic research provides abundant evidence of the potential that divestitures have to create value.[1] A study of 370 private and public companies found significant positive excess returns around the announcement of different types of divestitures.[2] Exhibit 28.2 summarizes the results.

The excess returns on announcement reflect the market's expectation that performance will improve at both the parent company and the business to be divested. Such expectations are justified. For example, operating margins of parent and spun-off businesses significantly improve during the five years after completing the transaction, and the growth rate of spun-off businesses nearly doubles.[3] Academic research confirms the improvements in operating

[1]See, for example, J. Miles and J. Rosenfeld, "The Effect of Voluntary Spin-Off Announcements on Shareholder Wealth," *Journal of Finance* 38 (1983): 1597–1606; K. Schipper and A. Smith, "A Comparison of Equity Carve-Outs and Seasoned Equity Offerings: Share Price Effects and Corporate Restructuring," *Journal of Financial Economics* 15 (1986): 153–186; K. Schipper and A. Smith, "Effects of Recontracting on Shareholder Wealth: The Case of Voluntary Spin-Offs," *Journal of Financial Economics* 12 (1983): 437–468; J. Allen and J. McConnell, "Equity Carve-Outs and Managerial Discretion," *Journal of Finance* 53 (1998): 163–186; and R. Michaely and W. Shaw, "The Choice of Going Public: Spin-Offs vs. Carve-Outs," *Financial Management* 24 (1995): 5–21.

[2]J. Mulherin and A. Boone, "Comparing Acquisitions and Divestitures," *Journal of Corporate Finance* 6 (2000): 117–139.

[3]See B. Huyett and T. Koller, "Finding the Courage to Shrink," *McKinsey on Finance*, no. 41 (Autumn 2011): 2–6.

performance, with larger improvements for the subsidiary than for the parent company.[4]

In addition, a McKinsey study of 200 large U.S. companies over a 10-year period showed that companies with a passive portfolio approach—those that did not sell businesses or only sold poor businesses under pressure—underperformed companies with an active portfolio approach over those years.[5] The best performers systematically divested companies, as well as acquired them.

The process is natural and ongoing, as the Siemens example highlights. A divested unit may pursue further separations later in its lifetime, especially in dynamic industries undergoing rapid growth and technological change. For example, in 2007, Tyco International split itself into three independent listed businesses: Tyco Healthcare (Covidien), Tyco Electronics (now TE Connectivity), and Tyco International. In 2012, the remaining Tyco International split itself again into three independent businesses: Tyco (commercial security and fire protection), Pentair (flow-control products), and ADT (residential security). Furthermore, in June 2013, Covidien (primarily focused on medical devices) spun off Mallinckrodt, its pharmaceutical division.

Divesting a business unit creates value when other owners can extract more value from it than the current owners can. This is the "best owner" principle described in Chapter 25. Value creation occurs because a new owner can realize superior synergies, but also because the divestiture eliminates some unique costs of the business unit itself and/or its current owner. Some of these costs can be hidden, such as when the overall company's culture is dominated by a mature business and limits innovation. In other cases, the costs can be more explicit—for example, when a company lacks core skills to be an effective operator in an industry. An active portfolio management approach creates value by avoiding, eliminating, or at least minimizing these costs.

Divesting underperforming businesses clearly avoids the direct costs of bearing deteriorating results. Companies that hold on to underperforming businesses too long, risk bringing down the value of the entire corporation. By the time the company is forced to conduct a fire sale of the assets, it has already destroyed substantial value and generally will receive limited proceeds from the divestiture. Managers should be in a better position than outsiders to determine a business's performance prospects. Research has shown that as a business becomes more mature and competitive challenges increase, it loses the potential for ongoing value creation, and its total returns to shareholders start to decline, relative to the business's industry sector.[6] An opportune moment to

[4] P. Cusatis, J. Miles, and J. Woolridge, "Some New Evidence That Spinoffs Create Value," *Journal of Applied Corporate Finance* 7 (1994): 100–107.

[5] J. Brandimarte, W. Fallon, and R. McNish, "Trading the Corporate Portfolio," *McKinsey on Finance* (Fall 2001): 1–5.

[6] R. Foster and S. Kaplan, *Creative Destruction* (New York: Doubleday, 2001).

divest the business is therefore shortly before market valuations begin to reflect its lower performance expectations.

However, divesting profitable and/or growing businesses also can benefit both the parent and the business unit. Well-established, mature businesses provide a company with stability and cash flows, but this stability can be a mixed blessing. For example, relatively large and stable units may dampen the impetus to innovate—a critical driver of success for smaller businesses in the portfolio. In addition, such large units often absorb a significant share of scarce management time that might be better spent on identifying growth opportunities. For example, under Bristol-Myers Squibb's ownership, the orthopedic-devices business Zimmer relied on pricing to grow its revenues. After its spin-off in 2001, it was able to boost its growth by investing more aggressively in new technologies, introducing new products, and expanding to new markets.

Other costs include the distortion of economic incentives as a result of cross-subsidization between business units. This can lead to inferior decision making, as well as conflicts of interest between business units. For example, during the early 1990s, Lucent—at that time a business unit of AT&T and a successful maker of telecom equipment—was selling its products to many of AT&T's competitors. To avoid conflict and to ease possible customer concerns, AT&T arranged to spin off Lucent in 1996. Conflicts of interest between business units can also arise from capital structure decisions, which was a key reason for the health-care divestiture announced by Tyco International in January 2006. As Tyco CFO Chris Coughlin explains, "We were driving the capital structure of all of Tyco on the basis of what a company in the health-care industry needed, but healthcare was only a quarter of our revenues. The other businesses clearly did not require that kind of a capital structure."[7] In these situations, a divestiture may create value because the subsidiary can become more competitive as a result of greater freedom to tailor financing and investment decisions, improved management incentives, or better focus.

A lack of parent company capabilities can hamper a business unit's performance. All businesses evolve through a life cycle, from start-up through expansion to maturity. Different skills and capabilities are needed to manage the business well at different moments in its life cycle: from a focus on innovation in the start-up phase, when a viable business idea and platform are created, to cost management skills at maturity, when efficiency is the key driver of success. Many corporations lack the full breadth and depth of skills. Typically, they excel in only a few capabilities, which also tend to be fairly static over time. Businesses ripe for divestiture could be at any stage in their life cycle and might well include a profitable, cash-generating business or a business with

[7] L. Corb and T. Koller, "When to Break Up a Conglomerate: An Interview with Tyco International's CFO," *McKinsey on Finance* (Autumn 2007): 12–18.

relatively high growth potential. Executives should therefore regularly review the corporate portfolio.

A common misperception about divestments is that they are an easy solution for undervaluation in the stock market. Some managers interpret the positive excess returns to divestment announcements as a confirmation that the divestment exposes value the market had overlooked. That interpretation is wrong. It is often based on a misleading "sum of the parts" analysis, showing that the current market value of the company is smaller than the sum of the values of its individual business. Unfortunately, the analyses often rely on valuation multiples of industry peers with higher performance or from different sectors than the company's businesses. When the analysis uses true peers, the conglomerate discount typically disappears (see Chapter 17).

WHY EXECUTIVES SHY AWAY FROM DIVESTITURES

Although an active portfolio approach recognizes the value to be created from divestitures, most executives seem to shy away from initiating them. The previously cited academic research on 370 companies confirmed that most companies are reactive in their use of divestitures, waiting until they have to respond to economic, technological, or regulatory shocks.

Looking at the 690 companies that remained in the global top 1,000 during the period from 2000 until 2013, almost 60 percent did not execute in any single year divestitures that exceeded 5 percent of their market value. About 20 percent of the companies had only one year out of the 14 in which divestments amounted to at least 5 percent of their value. The previously mentioned McKinsey study of 200 U.S. companies found that at least 75 percent of the transactions were made in reaction to some form of pressure, such as underperformance of the corporate parent, the business unit, or both.

When underperformance eventually becomes transparent to the market, investors exert continuous pressure on the corporation to divest. In an analysis of nondefault, or voluntary, asset sales, companies that decided to sell assets tended to be poor performers and highly leveraged, suggesting that most voluntary asset sales are reactive rather than part of a proactive divestiture program.[8] Other researchers have confirmed that parent companies tend to hold on to underperforming businesses too long.[9]

[8] L. Lang, A. Poulsen, and R. Stulz, "Asset Sales, Firm Performance, and the Agency Costs of Managerial Discretion," *Journal of Financial Economics* 37 (1994): 3–37.

[9] D. Ravenscraft and F. Scherer, *Mergers, Sell-Offs, and Economic Efficiency* (Washington, DC: Brookings Institution, 1987), 167; and M. Cho and M. Cohen, "The Economic Causes and Consequences of Corporate Divestiture," *Managerial and Decision Economics* 18 (1997): 367–374.

EXHIBIT 28.3 **Earnings Dilution through Divestitures**

$ million

			Use of proceeds		
	Company	Divested business unit	Hold cash	Debt repayment	Share buyback
Value of operations	2,800	450	2,350	2,350	2,350
Cash	–	–	550	–	–
Enterprise value	2,800	–	2,900	2,350	2,350
Debt	(600)	–	(600)	(50)	(600)
Market value of equity	2,200	–	2,300	2,300	1,750
Shares outstanding	100.0	–	100 .0	100.0	76.1
Share price	22.0	–	23.0	23.0	23.0
Invested capital	1,800	150	1,650	1,650	1,650
EBIT	236.0	50.0	186.0	186.0	186.0
Interest income (2%)	–	–	11.0	–	–
Interest expense (6%)	(36.0)	–	(36.0)	(3.0)	(36.0)
Pretax income	200.0	50.0	161.0	183.0	150.5
Taxes (25%)	(50.0)	(12.5)	(40.3)	(45.8)	(37.5)
Net income	150.0	37.5	120.8	137.3	112.5
Earnings per share, $	1.50	–	1.21	1.37	1.48
P/E	14.7	–	19.0	16.8	15.6
Pretax ROIC, %	13	33	11	11	11
Operating value/EBIT	11.9	9.0	15.6	12.6	12.6
Operating value/IC	1.6	3.0	1.8	1.4	1.4

In our experience, many managers dislike divestitures because these transactions could reduce the company's earnings per share, price-to-earnings (P/E) ratio, or other performance indicators. However, if the business is worth more to an outsider or as an independent company, the divestiture will create value and should be pursued. The example in Exhibit 28.3 illustrates this.

The company described in the two left columns can raise $550 million in cash from a divestment of a mature business unit. This unit has a relatively high return on invested capital (ROIC), but limited growth potential in the current ownership structure. The value of the business to the company is estimated at $450 million, so that selling it at $550 million clearly creates value for the company. Any resulting changes in earnings multiples (whether price to earnings or enterprise value to EBIT) or earnings per share for the company after the transaction are not relevant. Because divested units are typically the most mature businesses in a company's portfolio (with lower earnings multiples), divestitures often lead to increases in earnings multiples and decreases in earnings per share, but this does not indicate anything about value creation. For example, this particular divestment would increase the company's earnings multiple, even when carried out at a price below $450 million (which would clearly destroy value).

In addition, changes in earnings per share and the earnings multiple depend on how the company decides to use the cash proceeds from the divestment:

- *Holding cash:* If the parent holds on to the proceeds, it will dilute its earnings per share. The reason is straightforward: the interest rate earned on the cash is lower than the forgone earnings of the business unit, or the so-called earnings yield (earnings relative to value) of the divested business unit. This is just simple mathematics. However, the equity value increases, and the company's P/E is higher than before.
- *Repaying debt:* If the parent uses the proceeds to repay debt, earnings per share will still be lower than before the divestiture if the interest rate on the debt is lower than the earnings yield of the divested business. Dilution is less than in the scenario where the parent holds the cash, because the interest rate on debt is higher than the investment yield on cash holdings.
- *Buying back shares:* If the parent uses the proceeds to buy back shares, earnings per share will be diluted if the ratio of sales proceeds to earnings of the divested business unit is lower than the P/E of the remaining business. Again, the math is simple. In the example shown, the sale proceeds and the amount used for buybacks would have to increase to about $600 million in order for the divestment to become earnings accretive.

Even though the divestment causes the size of the company to be smaller (in terms of revenues and market capitalization) and its earnings per share to be lower, shareholders still benefit from this divestment. What matters is that the company generates more value from selling this business than from running it. Shareholders care about value, not size.

ASSESSING POTENTIAL VALUE FROM DIVESTITURES

A value-creating approach to divestitures can result in divesting good and bad businesses at any stage of their life cycle. Clearly, divesting a good business is often not an intuitive choice and may be hard for managers. It therefore makes sense to enforce some discipline in active portfolio management—for example, by holding regular, dedicated business exit review meetings, to ensure that the topic remains on the executive agenda, and by assigning units a "date stamp," or estimated time of exit. This practice has the advantage of obliging executives to evaluate all businesses as their sell-by date approaches, although executives may decide to retain businesses after that date. Other approaches to promote discipline include setting a limit on the number of businesses in the corporate portfolio or aiming for a target balance in acquisitions and divestitures. Such practices help transform divestitures from evidence of failure into shrewd strategies for building value.

The value created in a divestment for a seller's shareholders equals the price received by the seller minus the value forgone minus separation costs incurred by the seller:

$$\begin{aligned}\text{Value Created} = \text{Price Received} &- \text{Value Forgone}\\ &- \text{Cost of Separation}\end{aligned}$$

The value forgone equals the stand-alone value of the divested business as run by the current management team, plus any synergies with the rest of the parent's businesses. It represents the cash flows that the parent company has given up by selling the business. The costs of separation include the costs that the parent incurs to disentangle the business from its other businesses, plus the so-called stranded costs of any assets or activities that have become redundant after the divestment (costs that, as we will see, can often be substantially mitigated by restructuring central and shared services in the parent company). With this further breakdown, we have the following expression for value created:

$$\begin{aligned}\text{Value Created} = {} & \text{Price Received}\\ & - \text{Stand-Alone Value of Divested Business}\\ & - \text{Lost Synergies}\\ & - \text{Disentanglement Costs}\\ & - \text{Stranded Costs}\end{aligned}$$

This section discusses these synergies and costs. Also, it examines practical challenges around legal and regulatory issues, as well as pricing and liquidity of the businesses.

Lost Synergies

When a company divests a business unit, it may lose with it certain synergy benefits of having that business in its portfolio, even if the company isn't the best owner of the business. For example, a business unit may give cross-selling opportunities to other units. Likewise, a corporation may bundle its procurement for various businesses globally so that it enjoys significant discounts. Thus, divestment can result in lower discounts and higher costs for the remaining businesses, as well as for the divested business unit itself, when volumes decrease.

Divestments could also lead to the loss of nonoperating synergies related to taxes and financing, although these tend to be relatively small. For example, combining various businesses with different operating risk profiles may result in a group with a higher relative debt capacity than some of the businesses individually are able to sustain. Divestiture would reduce or eliminate this benefit. An integrated electricity player that divests its (regulated) transmission and/or distribution network business and keeps a portfolio of generation and supply units will have a very different risk profile after the divestiture and, consequently, a different debt capacity and corresponding value from tax shields. Divestments could further affect the ongoing tax position of a parent company if a divested business was providing the parent company with significant compensating tax losses. In this case, the parent could be incurring higher taxes over a number of years following divestment.

Disentanglement Costs

Depending on the extent to which a business unit is integrated within an organization and its operations, disentangling it can incur substantial expenses. Examples of such expenses include legal and advisory fees, information technology (IT) system replacement or reconfiguration costs, relocation costs, and retention bonuses. Disentanglements can be more complex than the integration processes of large M&A deals.

Taxes triggered by the divestment depend on the details of a proposed deal structure, but they too can have real impact on postdeal economics. Differences in fiscal regimes also play a role. In the European Union, profit (including capital gains) distributions from subsidiaries to parents are exempt from corporate income and withholding taxes. In the United States, corporations do not enjoy this so-called participation exemption for capital gains on divested subsidiaries. Depending on the fiscal regime, executives may therefore prefer different types of transactions (see discussion later in the chapter).

Stranded Costs

Stranded costs can be real but are easily overestimated. These are (corporate) costs for assets and activities associated with the business unit but ultimately not transferred with it. Stranded costs can relate to shared services, such as marketing and investor relations. They can also refer to IT infrastructure and shared production assets, for example when a single manufacturing facility consists of production lines of products from different business units. And they can relate to general overhead costs that are allocated to businesses. Some of these costs, such as the IT systems, are fixed and cannot be readily reduced regardless of the size of the divestiture. Others are more variable and can contract—for example, through a lower head count—but can still take years to unwind.

In our experience, divestments often bring to light excessive corporate overhead that cannot be transferred to the divested business unit and is subsumed under stranded costs. Large companies tend to have many layers of management and communication. This easily leads to redundancy and unnecessary costs. For example, sizable business units often have managers in human resources, strategic planning, or financial controlling functions whose primary job is to coordinate and communicate with their counterparts in the corporate headquarters. After a divestiture, such intercompany transaction costs can be largely eliminated in both the parent company and the divested businesses.

Don't ignore the parent company's stranded costs when analyzing a divestiture's potential to create value. Reducing a company's cost base after a divestiture might take considerable time and effort. McKinsey research has found that it often takes up to three years for the parent company to recover from stranded costs, leaving it with substantially lower profit margins during this period. A seller should therefore consider including a long-term or transitional service agreement for the divested business. This could help cover the costs for central and shared support services, at least in the near term. How to handle stranded costs will vary with the type of buyer. A strategic buyer may be able to absorb the divested business unit without all the corporate support services or even production facilities; a financial buyer may be more interested in acquiring the business with these services and facilities included.

Legal and Regulatory Barriers

The divestment process may be complicated by legal or regulatory issues. These are typically not large enough to distort the value-creation potential, but they can seriously slow down the process and add to the amount of work to be done, thereby increasing the time and resources required to come to closure. For example, pharmaceutical companies are required to have a so-called marketing authorization to sell an individual product in a specific market, typically a single country. If a pharmaceutical company decides to sell a particular product portfolio (e.g., oncology, respiratory, vaccines) to another pharmaceutical company, it needs to apply for a transfer of the marketing authorization for each individual product in each specific market. This is a time-consuming process that requires additional expenses. Asset transactions can be especially complex, because they require extensive documentation and contracts with respect to all the different categories of assets involved.

Contractual issues often come as unpleasant surprises that typically surface after companies have started the divestiture process. Procurement contracts, long-term contracts with customers, and loan agreements, for example, often require the creation of transitional service agreements between buyer and seller to guarantee continuity of the business unit. Or they may include change-of-ownership clauses activated upon divestiture that render the existing contract or agreement invalid when ownership in the business transfers.

Pricing and Liquidity

As discussed in Chapter 5, market valuation levels are generally in line with intrinsic value potential in the long term but can deviate in the short term. A near-term divestiture would seem to be a good idea if the market would price a business above management's estimate of its intrinsic value. The reverse holds as well: Siemens, for example, abandoned the initial public offering (IPO) of its lighting business OSRAM several times due to adverse market conditions.

Although external market factors may lower potential proceeds from a divestiture, management should balance this against the (hidden) costs of continuing with the status quo. Alternatively, management could look into transaction types that do not generate cash proceeds and thereby do not lock in an exit price for the company's shareholders. For example, as the credit crunch unfolded in 2008, Cadbury decided against a planned trade sale (in cash) of its American beverages business. Instead, it opted for a noncash demerger of the corporate group into two listed entities. This left Cadbury shareholders with the option to hold the shares of the American business and sell at some later stage, when prices might be higher.

Even when market valuation levels seem to be free of distortions and a company could reasonably expect a value-creating offer, a lack of other potential buyers may make the seller reluctant to pursue the transaction. An academic study concluded that liquidity is a key driver in explaining the difference in divestment behavior between companies that seem to have similar fundamental reasons to divest.[10] The more liquid a market for particular assets, the better the price setting is expected to be. In other words, more competing buyers are likely to produce a better price for the seller.

DECIDING ON TRANSACTION TYPE

Once a corporation has identified businesses for divestiture, it must decide what transaction structure to use. Its choices will depend on the availability of strategic or financial buyers, the need to raise cash, the benefits of retaining some level of control during the first phase of the separation, and fiscal implications for the company and/or its shareholders.

The remainder of this chapter provides a brief overview of different transaction types and discuss the trade-offs among alternative forms of public-ownership transactions, their impact on long-term performance, and the

[10]F. Schlingemann, R. Stulz, and R. Walkling, "Divestitures and the Liquidity of the Market for Corporate Assets," *Journal of Financial Economics* 64 (2002): 117–144.

dynamics of ownership structures over time. Executives can choose from many types of structures for private and public transactions:

Private transactions

- *Trade sale:* sale of part or all of a business to a strategic or financial investor
- *Joint venture:* a combination of part or all of a business with other industry players, other companies in the value chain, or venture capitalists

Public transactions

- *Initial public offering (IPO):* sale of all shares of a subsidiary to new shareholders in the stock market
- *Carve-out:* sale of part of the shares in a subsidiary to new shareholders in the stock market
- *Spin-off (or demerger):* distribution of all shares in a subsidiary to existing shareholders of the parent company
- *Split-off:* an offer to existing shareholders of the parent company to exchange their shares in the parent company for shares in the subsidiary
- *Tracking stock:* a separate class of parent shares that is distributed to existing shareholders of the parent company through a spin-off or sold to new shareholders through a carve-out

Private Transactions

Private transactions typically create the most value if other parties are considered to be better owners of the business. Private transactions allow the company to sell the business unit at a premium and capture value immediately. In most situations, the counterparties will be strategic buyers (that is, other industry players), but potential financial buyers also should be considered.

However, an outright sale may result in taxable gains that will put this alternative at a disadvantage. In the United States, for example, a company must pay income tax of 35 percent on any gain on a sale of a business. Businesses with relatively high ROIC or low capital intensity may therefore be less attractive candidates for an outright sale unless the premium offered justifies the capital gains tax. In many European countries, the so-called participation exemption makes the sale of the parent's shares in a subsidiary exempt from taxes.

Public Transactions

If the company cannot identify another company as better owner, it can consider public restructuring alternatives. All the public transactions in the preceding list involve the creation of a new public security, but not all of them actually result in cash proceeds. Full IPOs and carve-outs result in cash proceeds as securities are sold to new shareholders. In spin-off and split-off transactions, new securities are offered to existing shareholders, sometimes in exchange for other existing shares (split-offs).

In public transactions, shareholders do not earn a premium from the divestiture itself, but significant value may be created for shareholders in the future. For example, if industry consolidation is expected, a public transaction may be more beneficial for the shareholders in the long term if the newly floated business unit would drive the consolidation or would be a takeover candidate. The most common forms of public transactions are spin-offs, carve-outs, and tracking stock.

Spin-Offs The most common form of public ownership transaction is a spin-off. In the case of a spin-off, the parent company gives up control over the business unit by distributing the subsidiary shares to the parent's shareholders.[11] This full separation maximizes the strategic flexibility of the subsidiary, provides the greatest freedom to improve operations by sourcing from more competitive companies (instead of the former parent), and avoids conflicts of interest between the parent company and the business unit. Spin-offs are usually carried out to improve operating performance of the business units.

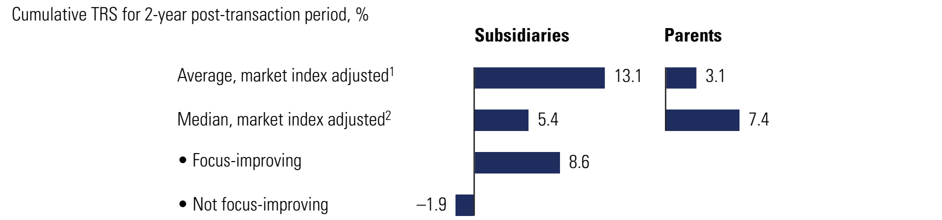
Depending on the jurisdiction, spin-offs can also offer tax benefits over alternatives such as trade sales and IPOs. In the United States, United Kingdom, and several countries of continental Europe, spin-offs can be structured as tax-free transactions. In the United States today, for example, a company must pay corporate income tax on any capital gains from the sale of a subsidiary, in contrast to the tax-free gains from a spin-off. Such benefits can make a spin-off more value-creating for shareholders than a trade sale at a sizable premium. Consider a hypothetical example in which a business with a tax book value of $300 million can be sold for $1.3 billion or spun off at an expected market capitalization of $1 billion. At a tax rate of 35 percent, the sale would leave the parent company with after-tax proceeds of $950 million that it could return to its shareholders. In a spin-off, the parent company would distribute shares in the business with an expected value of $1 billion to its shareholders.

Sometimes spin-offs are executed in two steps: a minority IPO (carve-out) followed by a full spin-off relatively shortly thereafter. Some advocates claim that a two-step spin-off has benefits: the initial minority listing establishes dedicated equity coverage, creates market making in the shares, and may reduce the risk of price pressure from flow-back by developing an interested investor base.[12]

[11] In the United States, spin-offs also happen under a so-called Reverse Morris Trust (RMT) structure, in which the spin-off business is immediately merged into another unrelated company as a tax-free merger.

[12] In a spin-off, all parent shareholders receive shares of the spun-off subsidiary. When parent shareholders subsequently sell these shares in the stock market, this gives rise to flow-back.

EXHIBIT 28.4 **Long-Term Market Performance of Spin-Offs**



1 Adjusted for either U.S. or European market index.
2 Adjusted for median return of index constituents over similar measurement period.
Source: Datastream, Compustat.

However, in most situations, these potential issues are rarely material and can be well managed in a one-step spin-off. For example, when Siemens spun off its OSRAM lighting business in 2013, some analysts and investors were concerned about flow-back because they considered OSRAM as one of Siemens's least attractive businesses. But the flow-back was effectively handled in a so-called balancing book that was used to match supply and demand for the OSRAM shares. No price pressure occurred. A one-step spin-off has the benefit of being less complex and does not depend on market circumstances, as no shares need to be sold to investors.

The evidence shows that spin-offs typically lead to significant improvements in operating margins for both parents and spun-off businesses during the five years after the transaction's completion. For the spun-off businesses studied, growth rates nearly doubled in this time span.[13] Academic research confirms the improvements in operating performance, with larger improvements for the subsidiary than for the parent company.[14] Some research concludes that operating improvements were significant only for focus-improving spin-offs—that is, transactions where the business spun off was different from the parent's core line of business.[15]

Post-transaction total returns to shareholders (TRS) for spin-off parents and subsidiaries are consistent with the results on operating improvements (see Exhibit 28.4). Academic research also shows that focus-improving spin-offs drive the subsidiaries' positive performance. Transactions that did not improve focus had mostly negative post-transaction returns.[16]

[13] See Huyett and Koller, "Finding the Courage to Shrink."
[14] Cusatis, Miles, and Woolridge, "Some New Evidence."
[15] L. Daley, V. Mehrotra, and R. Sivakumar, "Corporate Focus and Value Creation: Evidence from Spinoffs," *Journal of Financial Economics* 45 (1997): 257–281.
[16] Cusatis, Miles, and Woolridge, "Some New Evidence," find similar shareholder returns for parents and subsidiaries.

Carve-Outs If parent companies do not want to give up control over a business unit, they can consider a minority carve-out or possibly a tracking stock. Another reason to consider a carve-out is that the parent needs cash. Carve-outs were quite popular in the late 1990s during the boom in the telecom, media, and technology (TMT) sector. In recent years, carve-outs have become less popular, with the need for cash propelling most decisions to use a carve-out.

When thinking about partially separating ownership of a business unit through a carve-out, executives need to plan for full separation. The separated businesses should be able to attract new equity financing to fund their growth or perhaps pursuit of acquisitions, both of which will most likely dilute the parent's stake, ultimately leading to loss of control. Carve-outs produce real benefits only if they achieve independence from the parent company.

In our research on more than 200 carve-outs announced before 1998, the majority of the carve-out entities did not last.[17] As shown in Exhibit 23.5, only 8 percent of the carve-out subsidiaries analyzed remained majority-controlled by the parent. Only the carve-outs that gained independence from the parent delivered positive returns to shareholders. Those that were reacquired or remained parent controlled showed negative shareholder returns. Academic research has found similar results.[18] The market-adjusted long-term performance for carve-outs on average was negative, but different types of carve-outs differed significantly in their performance. Carve-outs from financially distressed parents showed negative returns and continue to have relatively low operating performance, indicating that they were partly contributing to the distress. Market performance appears to be better for carve-out transactions that improve the focus of both entities. Some publications also suggest a clear relationship between carve-out subsidiaries' success in the capital markets and the evolution of their ownership structure, similar to our results in Exhibit 28.5.[19]

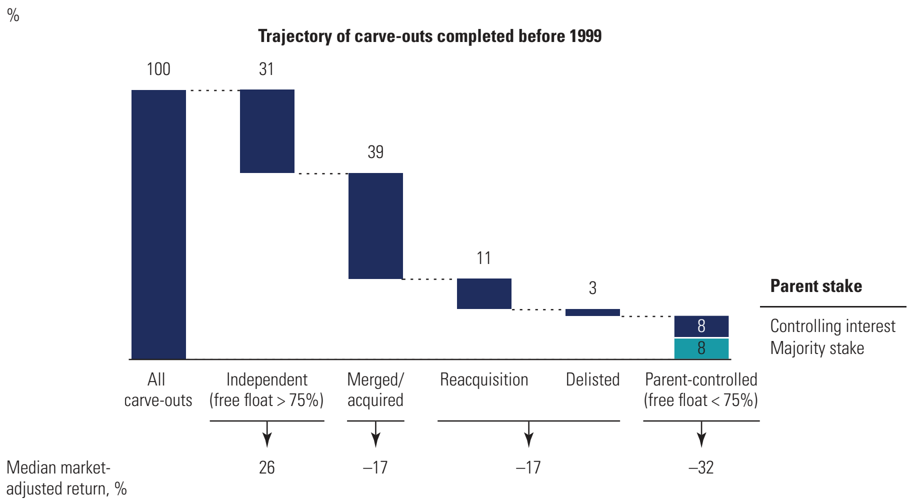
If the parent retains a controlling stake, this can lead to governance conflicts in the longer term. For example, enforcing a minimum controlling stake may restrict (acquisition) growth and value creation by the separated business, which would destroy the benefits that the carve-out was intended to deliver.

[17] A. Annema, W. Fallon, and M. Goedhart, "Do Carve-Outs Make Sense?" *McKinsey on Finance* (Fall 2001): 6–10.

[18] See, for example, J. Madura and T. Nixon, "The Long-Term Performance of Parent and Units Following Equity Carve-Outs," *Applied Financial Economics* 12 (2002): 171–181; and A. Vijh, "Long-Term Returns from Equity Carveouts," *Journal of Financial Economics* 51 (1999): 273–308.

[19] A. Klein, J. Rosenfeld, and W. Beranek, "The Two Stages of an Equity Carve-Out and the Price Response of Parent and Subsidiary Stock," *Managerial and Decision Economics* 12 (1991): 449–460; K. Gleason, J. Madura, and A. K. Pennathur, "Valuation and Performance of Reacquisitions Following Equity Carve-Outs," *Financial Review* 41 (2006): 229–246; and M. Otsubo, "Gains from Equity Carve-Outs and Subsequent Events," *Journal of Business Research* 62 (2008): 1207–1213.

EXHIBIT 28.5 **Typical Carve-Out Trajectories**



Source: Datastream; Factiva.

Tracking stock An alternative form of public ownership restructuring is the issuance of tracking stock. Tracking stock offers a parent the advantage of maintaining control over a separated subsidiary, but it often complicates corporate governance. Because there is no formal, legal separation between the subsidiary and the parent, a single board of directors needs to decide on potentially competing needs of common and tracking stock shareholders.

In addition to producing competing needs, tracking stocks also result in both entities being liable for each other's debt, which precludes flexible capital raising. Although there may be specific tax or legal barriers in the way of separation that would favor the use of a tracking stock alternative, the evidence for tracking stock is far from convincing. In an analysis of tracking stocks, this kind of transaction appeared to destroy value in the long term.[20] On the elimination of tracking stock, the announcement effect for the parent was positive, reflecting the market's relief that the structure had been discontinued.

At this moment, no major U.S. or European company has tracking stock outstanding, implying that this form of ownership restructuring fails to bring the benefits executives are looking for.

[20] M. Billett and A. Vijh, "The Wealth Effects of Tracking Stock Restructurings," *Journal of Financial Research* 27 (2004): 559–583.

SUMMARY

As businesses develop through their life cycles, they pose new challenges to the parent company. Parent companies therefore should continually reevaluate which businesses to keep and which to divest. However, most corporations divest businesses only after resisting shareholder pressure. In delaying, they risk forgoing potentially significant value.

Senior executives should prepare the organization for this cultural shift to a more active approach. They should deliver the message that their new approach will entail divesting good businesses, and such divestitures should not be considered failures. Because divesting good businesses may be hard for managers, corporations should build forcing mechanisms into their divestiture programs. To increase the chances of a successful divestiture, executives should thoroughly identify the implications for the economics of the remaining businesses and consider these implications when structuring the divestiture agreement. Executives should also not underestimate the time and effort required to complete a divestiture.

29

Capital Structure, Dividends, and Share Repurchases

Capital structure decisions, including those related to dividends and share repurchases, are important. It's not so much that making the right decisions will create significant value; it's that making the wrong calls could destroy tremendous amounts of value. For example, we know that in the years running up to the 2008 financial crisis, investment bankers advised some very large companies to increase their debt levels considerably in order to pay out substantial amounts of cash to shareholders (in some cases, as much as $50 billion). The idea was that this would increase earnings per share and thereby boost value to shareholders. Fortunately, these companies did not go along with the idea; if they had, several of them would have ended up in financial distress or bankruptcy when the financial crisis unfolded.

The primary objective of a company's capital structure, dividend, and share repurchase decisions should be to ensure that it has enough capital to pursue its strategic objectives and to weather any possible cash shortfalls along the way. If a company doesn't have enough capital, it will either pass up opportunities or, worse, fall into financial distress or even bankruptcy. When a company holds excess capital, the remedy is much easier: it can always increase its cash distributions to shareholders.

This chapter explains how managers should decide on an appropriate capital structure for their company and how they should develop a supporting policy for returning cash to shareholders or raising new capital. A comprehensive case example toward the end of the chapter offers a step-by-step approach.

A PRACTICAL FRAMEWORK

A company's financial decisions boil down to three things: how much to invest, how much debt to have, and how much cash to return to shareholders. A company should order its priorities for using cash around the ability to create value. As the conservation of value principle in Chapter 3 indicates, companies primarily create value by generating cash flow from operations and by investing capital at returns above their cost of capital. Any value that might be created by capital structure and payout decisions pales relative to the impact of generating operating cash flows. Making the right choices between debt and equity can have real impact on tax benefits and management discipline, but the upside for a company's value is not more than a couple of percentage points. Far more significant, however, is the potential downside from the loss of flexibility to withstand shortfalls in operating cash flows. Paying out cash to shareholders through dividends and share repurchases may boost a company's share price in the short run, but it doesn't directly create any value. The increase only reflects higher expectations for future operating cash flows, as the payout signals management discipline in the use of capital and confidence in the company's outlook. But if the company fails to meet these expectations, the price will drop again.

For establishing capital structure and payout policies, we recommend a sequential approach. A prerequisite is, of course, to define the company's strategy. The approach itself consists of four stages:

1. Project and test the operating cash flows.
2. Develop a capital structure target based on the company's risk profile and risk appetite.
3. Estimate the surplus or deficit cash flow to shareholders by combining the operating cash flow and the capital structure target.
4. Decide on the payout of cash flow surplus and financing of cash flow deficit, including tactical measures, such as share repurchases, dividend payouts, share issuances, and measures to adjust the company's debt to the specified target levels.

Consider applying the approach to an international consumer products company we call GlobalCo.[1] Over the past years, GlobalCo has generated operating earnings of around 15 percent of revenues and growth of about 10 percent a year, mainly driven by acquisitions. Traditionally, GlobalCo held little debt, but its recent acquisitions have driven up its ratio of net debt to earnings before interest, taxes, and amortization (EBITA) from 2.0 in 2010 to 4.5 in 2014.

[1] A more comprehensive case example is presented in later in this chapter.

EXHIBIT 29.1 **GlobalCo: Target Capital Structure**

€ million

	Base-case scenario	Downside scenario
Projected EBITA, 2018	1,945	1,621
Target net debt/EBITA	4.0	4.0
Net debt capacity, 2018[1]	7,779	6,483
Reserve for unexpected investments	(779)	–
Buffer from potential divestments	–	517
Target net debt, 2018	7,000	7,000
Project cumulative cash flow, 2015–2018	3,220	2,587
Less: Dividends at current payout ratio	(1,489)	(1,280)
Less: Current net debt	(7,148)	(7,148)
Cash flow surplus for shareholders, 2015–2018[2]	1,583	1,159

[1] Net debt at target ratio over EBITA.
[2] In addition to dividends at current payout ratio.

Step 1: Project and test operating cash flows GlobalCo has no plans for acquisitions or significant investment outlays over the next four years. Its strategic plans under a base-case scenario foresee organic revenue growth of 5 percent at profit margins of around 15 percent until 2020. For the base-case scenario, GlobalCo's EBITA for 2018 is forecast at €1.9 billion. We test the price and volume risks in GlobalCo's key markets by developing a downside scenario, in which EBITA in 2018 reaches only €1.6 billion. For companies in some other industries where price and volume risks are greater, such as commodities, you might replace the use of two scenarios with a more sophisticated approach: modeling future cash flows by using stochastic simulation techniques to estimate the probability of financial distress at the various debt levels.

Step 2: Develop capital structure target Next, we set a target credit rating and estimate the corresponding coverage ratios to develop a capital structure target. Although GlobalCo's operating performance is normally stable, we target the high end of a BBB credit rating because of the company's currency risk as an exporter. We translate the target credit rating to a target net-debt-to-EBITA coverage ratio of 4.0 times.[2]

Step 3: Estimate surplus or deficit Based on the target coverage ratio and projections of operating cash flows, we can make estimates of GlobalCo's target capital structure for 2018 (see Exhibit 29.1). For the base-case scenario, €1.9 billion of EBITA and a target coverage ratio of 4 times result in a debt level of €7.8 billion in 2018. In the downside scenario, the operating profit allows for

[2] As discussed later in this chapter, empirical analysis shows that credit ratings can be modeled well with three factors: industry, size, and interest coverage.

a target debt level of only €6.5 billion in order to maintain an investment-grade rating. We set the final targeted debt level for 2018 at €7.0 billion, assuming that GlobalCo could improve its coverage ratio by around 10 percent through cost reductions and asset divestments if needed in the downside scenario. In the base-case scenario, it leaves the company with a spare debt capacity of €0.8 billion for unexpected investment opportunities. Assuming that GlobalCo gradually moves toward its target debt level over the next four years, it will end up with a surplus cash flow to shareholders of €1.6 billion in the base scenario and €1.2 billion in the downside scenario.

Step 4: Decide on payout of surplus or financing of deficit The final step is to decide what payout and financing over the ensuing years will move the company to its target capital structure. Given its cash flow surplus of €1.2 billion under even the downside scenario, GlobalCo could decide on a mix of payout options. Its current dividend payout ratio at 33 percent of earnings is low, considering its modest growth and strong cash flow. Over the next four years, GlobalCo can easily return €0.5 billion extra to its shareholders by raising its payout ratio to 45 percent. Increasing the regular dividend sends a strong signal to the stock market that GlobalCo is confident about its business outlook and its ability to sustain the dividend level. The remaining €0.7 billion could be returned to shareholders over the next several years through share repurchases or extraordinary dividends. Share repurchases and extraordinary dividends also signal confidence, but investors won't see them as a commitment to additional payouts in future years. This gives GlobalCo some valuable flexibility to change the amount of cash paid out over the next years—increasing it, for example, when management is certain that the company will achieve the base-case projection.

SETTING A TARGET CAPITAL STRUCTURE

Companies can choose from a wide variety of financing instruments, ranging from traditional common equity and straight debt to more exotic instruments, among them convertible preferred equity and convertible and commodity-linked debt. But the essential choice remains between straight debt and common equity—and this is a balancing act. Tilting toward equity provides more flexibility for managers to work through unexpected downturns or take advantage of unforeseen opportunities (like acquisitions). More debt provides tax benefits and management discipline over investment spending.

Ideally, mature companies with stable and predictable cash flows and limited investment opportunities should include more debt in their capital structure. Why? The discipline and tax benefits that debt often brings outweigh the need for flexibility. Companies that face high uncertainty because of vigorous growth or the cyclical nature of their industry should carry less debt in order to maintain the flexibility to take advantage of investment opportunities or respond to negative events.

For larger companies, balancing the trade-offs between debt and equity typically leads to a target capital structure with an investment-grade rating between A+ and BBB–, as we explore later in our discussion of target ratings. Lower credit ratings can severely restrict a company's access to debt funding, because many investors are barred from holding sub-investment-grade debt. Higher credit ratings offer little or no additional benefits, as a company's flexibility to pursue investment opportunities is typically high enough once it reaches a solid investment-grade rating. It is therefore no surprise that the majority of large exchange-listed companies worldwide have capital structures with credit ratings in this target range.

Fundamental Debt/Equity Trade-Offs

What amount of leverage would create the most value for shareholders? Although academic researchers have for decades investigated the issue of an optimal debt-to-equity ratio, a clear model remains elusive.[3]

The most obvious benefit of debt over equity is reduced taxes. Interest charges for debt are tax deductible; payments to shareholders as dividends and share repurchases are not. Replacing equity with debt reduces taxes, increasing the company's aggregate cash flow and its value.[4] That said, this tax effect does not make 100 percent debt funding the best approach. More debt funding may reduce corporate taxes but could actually lead to higher taxes for investors. In many countries, investor taxes are higher on interest income than on capital gains on shares, a circumstance that could make equity funding more attractive, depending on the relevant tax rates for corporations and investors.[5]

According to the free-cash-flow hypothesis,[6] debt can also impose investment discipline on managers, as private-equity firms have known for decades. Especially in companies with strong cash flows and few growth opportunities, managers may be tempted to increase corporate spending on perks or investment projects and acquisitions that will boost growth at the expense of value.

[3]For an overview of the literature, see M. Barclay and C. Smith, "The Capital Structure Puzzle: Another Look at the Evidence," *Journal of Applied Corporate Finance* 12, no. 1 (1999): 8–20.
[4]For an overview, see M. Grinblatt and S. Titman, *Financial Markets and Corporate Strategy*, 2nd ed. (New York: McGraw-Hill, 2002), chap. 14; and R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 9th ed. (New York: McGraw-Hill, 2008), chap. 19.
[5]M. Miller, "Debt and Taxes," *Journal of Finance* 32, no. 2 (1977): 261–275.
[6]M. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review* 76, no. 2 (1986): 323–339.

If share ownership is widely dispersed, it is difficult and costly for shareholders to assess when managers are engaging in such overinvestment. Debt curbs such behavior by forcing the company to pay out free cash flow according to scheduled interest and principal obligations before managers can make any additional investments.

However, higher levels of debt reduce financial flexibility for companies, giving rise to costs from business erosion and investor conflicts.[7] Highly leveraged companies have less flexibility to pursue investment opportunities or free up budgets for research and development (R&D), since they need cash available to repay debts on time. They may also have limited access to new borrowing when credit is tight, as during the 2008 financial crisis, especially if their debt is not investment grade.

As a result, these companies may miss significant opportunities to create value. They are also more likely to lose customers, employees, and suppliers because of their greater risk of financial distress. For example, suppliers to highly indebted retailers typically demand up-front payment, sometimes creating a negative cycle of lower stocks leading to lower sales leading to more difficulty in meeting debt schedules, and so on. The risk of losing customers is particularly high when the products require long-term service and maintenance. For example, Chrysler and General Motors (including its European subsidiary, Opel) lost considerable market share to Japanese and European competitors as they faced financial distress during the 2008 credit crisis. Ultimately, such business erosion can even lead to bankruptcy.

Higher leverage may cause additional loss of value as a result of conflicts of interest among debt holders, shareholders, and managers. For example, when companies come close to defaulting on their debt, shareholders will prefer to take out cash or invest it in high-risk opportunities, at the expense of debt holders.[8] Of course, debt holders anticipate such conflicts and try to protect themselves by restrictive covenants and other costly measures.

Evidence on Debt/Equity Trade-Offs

Although finance theory is clear about the sources of costs and benefits of leverage, it does not tell us specifically how to measure the best capital structure for a given company. Fortunately, it turns out that capital structure has less impact on value than many practitioners think. In addition, evidence from academic

[7] We prefer the term *business erosion* to the more often used *financial distress* because the associated costs arise very gradually and long before there may be an actual distress event, such as nonperformance on debt.

[8] In finance theory, these effects from high leverage are called corporate underinvestment (taking out cash rather than investing at low risk) and asset substitution (exchanging lower-risk assets for higher-risk assets); see, for example, S. Ross, R. Westerfield, and J. Jaffe, *Corporate Finance*, 6th ed. (New York: McGraw-Hill, 2001), 427–430.

research shows that companies adopt different leverage, depending on their characteristics, as one would expect from fundamental debt/equity trade-offs.[9]

Leverage should be higher for companies with higher returns, lower growth and risk, or larger and more fungible assets. Indeed, the most highly leveraged industries are typically mature and asset intensive (think cement, packaged consumer goods, and utilities). Their stable profits enable high tax savings from interest deductibility, and their low growth calls for strong management discipline (given the likelihood of overinvesting). Because they have assets that can serve as collateral and be redeployed after bankruptcy, the expected costs of business erosion are lower. This also explains why airlines can sustain high leverage: in spite of their low returns and high risk, airplanes are easily deployed for use by other airline companies in the event of a bankruptcy.[10] Note that direct bankruptcy costs are relatively small, around 3 percent of a company's market value before it becomes distressed.[11]

Leverage should be lower for companies with lower returns, higher growth potential and risk, or highly specific assets and capabilities. This is the case in sectors such as software, biotechnology, and high-tech start-ups. Potential tax savings are small, because their taxable profits are low in the near term. Management needs more financial freedom, because investments are essential to capture future growth. In contrast, the costs of business erosion are high because these companies would quickly lose valuable growth opportunities, and any remaining assets have very little value to third parties. For the same reasons, companies with more volatile earnings and higher advertising and R&D costs are generally financed with less debt.[12] Leverage also tends to be low for companies producing durable goods, such as machinery and equipment, requiring long-term maintenance and support. The highly specific capabilities of these companies make financial distress costly for their customers.[13]

Although some finance textbooks show a high potential tax benefit from higher leverage, it is rarely significant for large, investment-grade companies. To illustrate, consider a simple example. Exhibit 29.2 shows how the multiple of enterprise value over EBITA for an average company in the S&P 500 would change along with the amount of the company's debt financing, as measured by the EBITA-to-interest coverage ratio. The EBITA multiple is estimated using

[9] R. Rajan and L. Zingales, "What Do We Know about Capital Structure? Some Evidence from International Data," *Journal of Finance* 50, no. 5 (1995): 1421–1460.

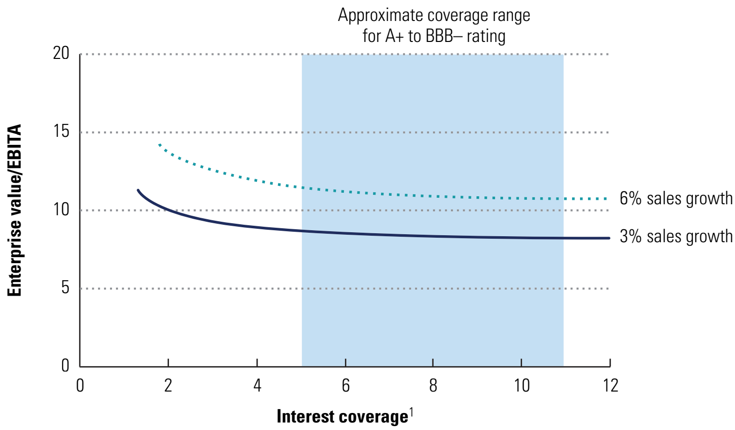
[10] Specifically, leverage is high when the operating leases of aircraft are taken into account.

[11] See, for example, L. Weiss, "Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims," *Journal of Financial Economics* 27, no. 2 (1990): 285–314.

[12] M. Bradley, G. Jarell, and E. Kim, "On the Existence of an Optimal Capital Structure: Theory and Evidence," *Journal of Finance* 39, no. 3 (1984): 857–878; and M. Long and I. Malitz, "The Investment-Financing Nexus: Some Empirical Evidence," *Midland Corporate Finance Journal* 3, no. 3 (1985): 53–59.

[13] See Barclay and Smith, "The Capital Structure Puzzle"; and S. Titman and R. Wessels, "The Determinants of Capital Structure Choice," *Journal of Finance* 43, no. 1 (1988): 1–19.

EXHIBIT 29.2 **Capital Structure's Limited Impact on Enterprise Value**



[1] EBITA/interest.

the basic value driver formula, as presented in Chapter 2, and applied using an adjusted-present-value (APV) methodology.[14] We assume a long-term ROIC of 14 percent and an unlevered cost of capital of 9 percent—typical scores for a middle-of-the-road S&P 500 company. As Exhibit 29.2 indicates, tax-related benefits from debt do not change enterprise value dramatically, except at very low levels of interest coverage (below 2) rarely seen for large, investment-grade companies.[15] Compare that with the much bigger impact on shareholder value of key value drivers such as return on invested capital (ROIC) and growth.

[14]Applying the APV methodology to the value driver formula and discounting the tax shield on interest at the unlevered cost of equity results in the following formula:

$$\text{Value} = \text{NOPLAT}\left(\frac{1 - \frac{g}{\text{ROIC}}}{k_U - g}\right) + \sum_{t=1}^{\infty} \frac{k_D \times T \times D_t}{(1 + k_U)^t}$$

where k_U is the unlevered cost of equity, D_t is the debt in year t, k_D is the cost of debt, T is the tax rate, and all other symbols are as defined in Chapter 2.

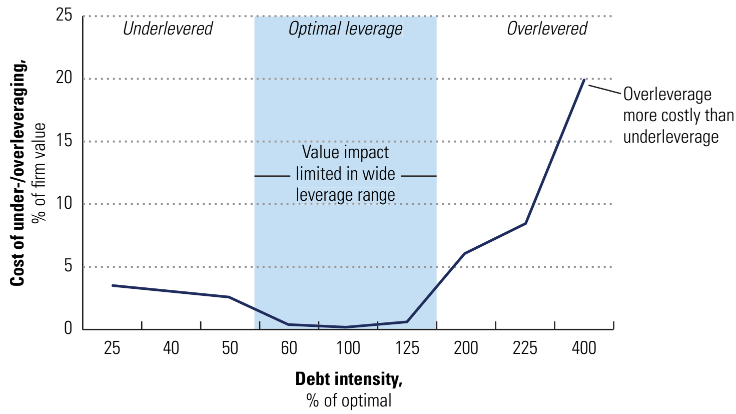
If we make the additional assumption that companies finance with debt while maintaining a stable interest coverage ratio, the formula can be simplified as follows:

$$\text{Value} = \text{NOPLAT}\left(\frac{1 - \frac{g}{\text{ROIC}} + \frac{T}{1-T}\left[\frac{\text{Interest}}{\text{EBITA}}\right]}{k_U - g}\right)$$

where EBITA/Interest is the target coverage ratio.

[15]Note that at such low levels of coverage, the expected value of any tax savings will itself decline because of the growing probability that the company will not capture these savings in the first place. As a result, the true curve would be even flatter than shown here.

EXHIBIT 29.3 **More to Lose Than to Gain from Capital Structure Management**



Source: J. Van Binsbergen, J. Graham, and J. Yang, "The Cost of Debt", *Journal of Finance*, 65, no. 6 (2010).

In contrast, losses in flexibility from higher leverage do translate to significant value destruction. John Graham and others examined listed U.S. companies over a period of more than 25 years and analyzed the loss in a company's value due to deviations of its leverage from what was estimated as its theoretical optimum.[16] The analysis offers two key insights, illustrated in Exhibit 29.3. First, it confirms our analysis that value at stake is limited to no more than a couple of percentage points for a fairly wide range of leverage around the theoretical optimum. Second, it shows that there is a lot more downside from having too much debt than from having too little. In other words, the losses due to diminished flexibility tend to outweigh the gains from tax benefits and management discipline.

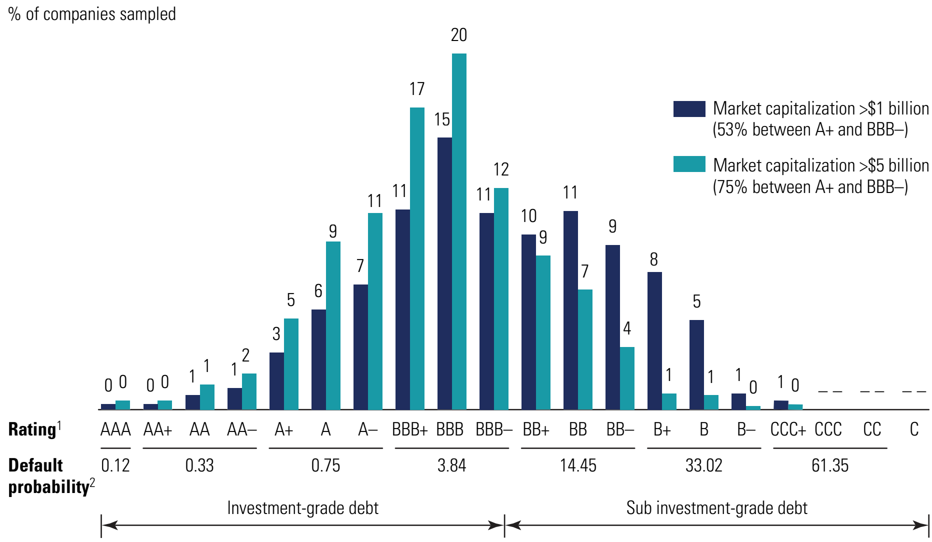
Credit Ratings and Target Capital Structure

Difficult as it may be to determine an *optimal* capital structure, it is much easier to find an *effective* structure—that is, one that cannot clearly be improved upon in terms of shareholder value creation because it is somewhere in the relatively flat range of the valuation curves of Exhibits 29.2 and 29.3.

Exhibit 29.4 shows the distribution of credit ratings and the associated average probability of default for all U.S. and European companies with a market capitalization over $1 billion according to Standard & Poor's. The ratings serve as indicators of a company's credit quality and range between AAA (highest quality) and D (defaulted). Ratings of BBB– and higher indicate

[16]See, for example, J. Van Binsbergen, J. Graham, and J. Yang, "The Cost of Debt," *Journal of Finance* 65, no. 6 (2010): 2089–2136.

EXHIBIT 29.4 **Credit Ratings for Large Companies: Mostly between A+ and BBB–**



[1] Standard & Poor's credit ratings for all U.S. and European companies with a market capitalization over $1 billion.
[2] Cumulative probability of default within 5 years based on default between 2004 and 2013.

Source: Datastream, Bloomberg.

so-called investment-grade quality. The majority of the companies in Exhibit 29.4 are in the rating categories of A+ to BBB– (the majority is even higher—75 percent—for companies with a market capitalization over $5 billion). This is apparently an effective rating level: credit ratings are fairly stable over time, so most companies probably do not move in and out of this range. Few companies are at rating levels of AA– and higher, because too little leverage would leave too much value on the table in the form of tax savings and management discipline. At the other extreme, below the rating level of BBB–, the costs of business erosion and investor conflicts associated with high leverage become too onerous. At these ratings, the opportunities for debt funding are much smaller, because many investors are barred from investing in sub-investment-grade debt.

To understand how to translate an effective investment-grade (A+ to BBB–) rating as above into a capital structure target for a company, it is important to understand what a company's credit rating represents and what drives it. Empirical evidence shows that credit ratings are primarily related to two financial indicators.[17] The first indicator is *size* in terms of sales or market capitalization. However, this indicator makes a difference only for very large or

[17]For an overview, see R. Cantor, "An Introduction to Recent Research on Credit Ratings," *Journal of Banking and Finance* 28, no. 11 (2004): 2565–2573; and E. Altman, "Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankruptcy," *Journal of Finance* 23, no. 4 (1968): 589–609; or J. Pettit,

very small companies. For example, as of 2014, all three companies with AAA ratings (Microsoft, Johnson & Johnson, and Exxon Mobil) have market capitalizations above $300 billion. One possible explanation: larger companies are more likely to diversify their risk.

The second indicator is *coverage* in terms of EBITA or EBITDA relative to interest expense or debt, defined as follows:

$$\text{Debt Coverage} = \frac{\text{Net Debt}}{\text{EBITA}} \text{ or } \frac{\text{Net Debt}}{\text{EBITDA}}$$

$$\text{Interest Coverage} = \frac{\text{EBITA}}{\text{Interest}} \text{ or } \frac{\text{EBITDA}}{\text{Interest}}$$

where EBITDA refers to earnings before interest, taxes, depreciation, and amortization.

Coverage is more relevant than size when you are setting a capital structure target. Basically, it represents a company's ability to comply with its debt service obligations. For example, EBITA interest coverage measures how many times a company could pay its interest commitments out of its pretax operational cash flow if it invested only an amount equal to its annual depreciation charges to keep the business running (or, for EBITDA coverage, if it invested nothing at all). In today's low-interest-rate environment, however, debt coverage is a better measure of a company's long-term ability to service its debt. Interest coverage ratios might appear strong today for some companies, simply because they attracted debt at low interest rates over the past few years. When these companies need to re-fund the debt at higher rates in the future, their interest coverage will plummet.

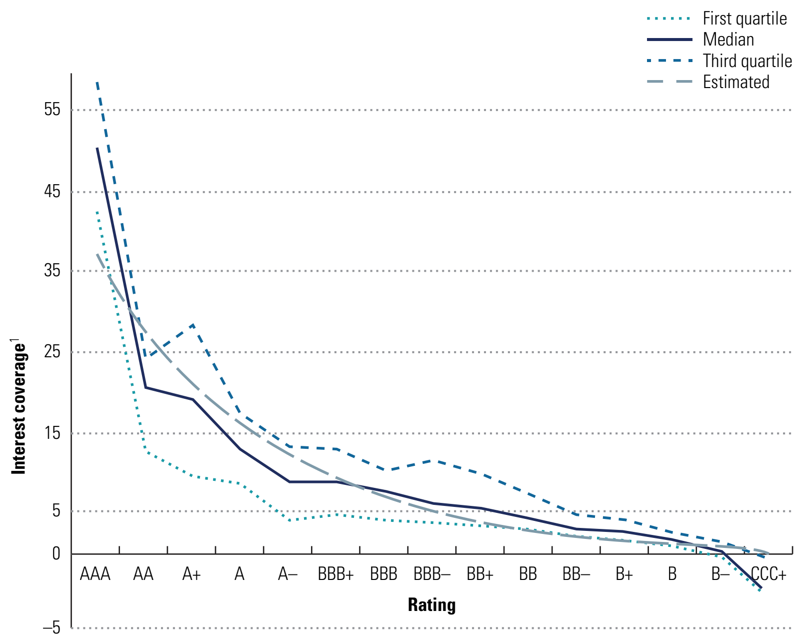
Exhibit 29.5 shows how interest coverage alone explains rating differences for a sample containing large U.S. and European companies rated by Standard & Poor's (excluding financial institutions). Obviously, we could further refine the analysis by including more explanatory ratios, such as net debt to EBITDA, free flow from operations (FFO) to interest, solvency, and more. However, these ratios are often highly correlated, so calculating them does not always make for a clearer explanation.

For a given credit rating, the coverage will typically differ by industry, because of differences in underlying business risk. Companies with more volatile earnings need higher coverage to attain a given credit rating, because their cash flow is more likely to fall short of their interest commitments (see Exhibit 29.6).[18] For example, steel companies will need higher levels of interest coverage than telecom companies to attain the same credit rating. By taking into account these differences in coverage requirements across industries,

C. Fitt, S. Orlov, and A. Kalsekar, "The New World of Credit Ratings," UBS research report (September 2004).

[18]EBITDA volatility is measured here as the average standard deviation of relative annual changes in EBITDA for the largest 25 companies in each sector in terms of market capitalization.

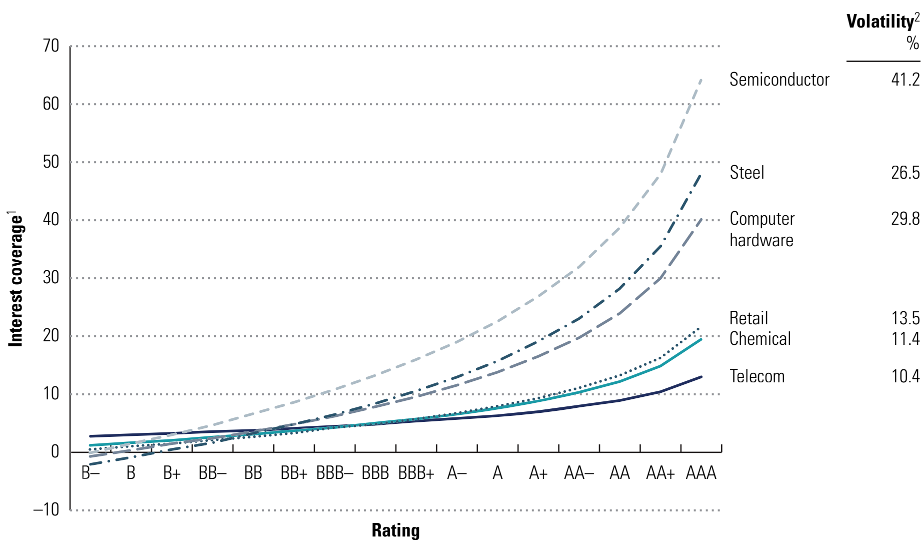
EXHIBIT 29.5 **Interest Coverage Explaining Credit Rating**



[1] EBITA/interest.

Source: Standard & Poor's RatingsDirect database, McKinsey Corporate Performance Center analysis.

EXHIBIT 29.6 **Interest Coverage and Credit Rating for Selected Industry Sectors**



[1] EBITDA/interest.
[2] Median volatility of EBITDA over the prior 5 years for the largest 25 companies in each sector.

Source: Standard & Poor's RatingsDirect database, McKinsey Corporate Performance Center analysis.

we can translate a company's targeted credit rating into a target coverage ratio. Based on the company's estimated future operating profit (and interest rate), we can derive its maximum debt capacity for the chosen credit rating and, thereby, its target capital structure. For example, companies aiming for an investment-grade rating in telecommunication services would typically need to have a net-debt-to-EBITA ratio of around 2.0 or better. Given projections of near-term EBITA, you can easily derive the target amount of net debt for such a company to reach an investment-grade rating.

It is important to compare a target capital structure for a company against that of its industry peer group. The key determinants of value trade-offs in designing capital structure—growth, return, and asset specificity—are largely industry specific, so that any large differences in capital structure would require further investigation. It also makes sense from a competitive perspective: as long as your capital structure is not too different, you have at least not given away any competitive advantage derived from capital structure (nor have you gained any).[19] Since the 1960s, a body of evidence has built up showing company credit ratios clustered around industry-specific averages, further indicating that each industry has its own effective capital structure.[20]

From a company's credit rating, you can also estimate the interest rate payable on its debt funding. The difference between the yields on corporate bonds and risk-free bonds—the *credit spread*—is greater for companies with lower credit ratings, because their probability of default is higher. Exhibit 29.7 plots cumulative default probabilities against the credit ratings over five and 10 years and the average credit spreads for each rating. The credit spread reflects the increasing default probability almost proportionally, but for ratings below the investment-grade benchmark of BBB, it increases more sharply. One explanation is that some institutional investors cannot invest in debt that is below investment grade (BBB–), so the debt market is considerably smaller for below-investment-grade debt, and interest rates correspondingly higher.

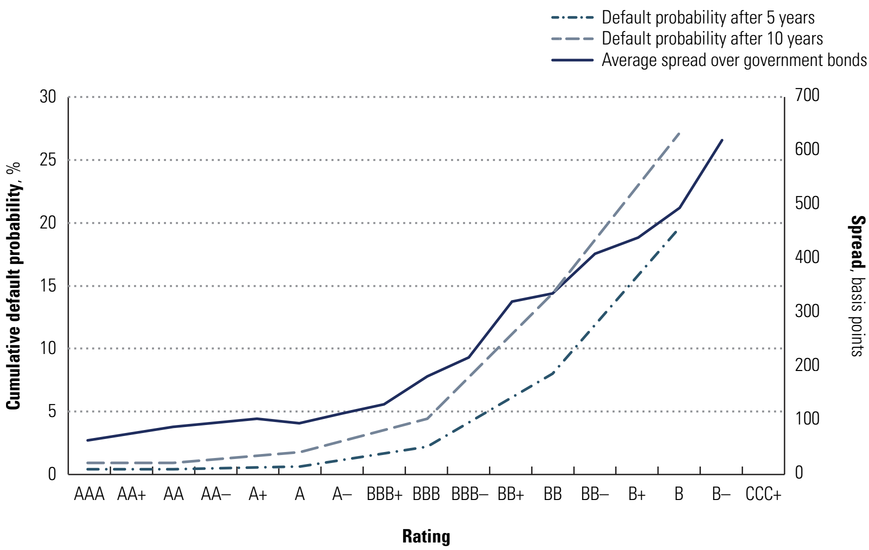
DECIDING ON PAYOUT AND FINANCING

Once a company has set a capital structure target, it needs to decide on the payout and financing measures that will move it to that target structure, as described in the four-stage framework. Indeed, empirical analyses have demonstrated that companies actively manage their capital structure around

[19]For example, there is academic evidence that high-leverage companies sometimes fall victim to price wars started by financially stronger competitors. See P. Bolton and D. Scharfstein, "A Theory of Predation Based on Agency Problems in Financial Contracting," *American Economic Review* 80, no. 1 (1990): 93–106.

[20]E. Schwarz and R. Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure," *Journal of Finance* 22, no. 1 (1967): 10–18.

EXHIBIT 29.7 **Default Probability and Credit Spread**



Source: Bloomberg, Standard & Poor's RatingsDirect database, McKinsey Corporate Performance Center analysis.

certain leverage boundaries.[21] They are much more likely to issue equity when they are overleveraged relative to this target, and much less likely when they are underleveraged. They make adjustments to regain their target capital structure after they have missed it for one or two years, rather than immediately after each change in leverage; continual adjustment would be impractical and costly due to share price volatility and transaction costs.[22]

For listed companies, payout and financing decisions are complicated by the fact that they send the capital markets signals about a company's prospects. Investors assume that managers possess more information than investors have about the company's true business and financial outlook. Of course, managers can and do communicate directly with investors, but investors tend to give less credence to words than to actions. Therefore, they analyze management's decisions on offerings or repurchases of debt and equity and on dividends for any signals of the company's financial prospects. Managers should be aware of giving out such signals before making such payout and financing decisions. Signaling unrealistically rosy prospects will ultimately backfire.

[21]P. Marsh, "The Choice between Equity and Debt: An Empirical Study," *Journal of Finance* 37, no. 1 (1982): 121–144.
[22]See, for example, M. Leary and M. Roberts, "Do Firms Rebalance Their Capital Structures?" *Journal of Finance* 60, no. 6 (2005): 2575–2619.

However, keep in mind that although these signals may lead to short-term price reactions, they do not increase or decrease intrinsic value as such.[23] Intrinsic value is driven by the net cash flows from a company's operations, not by its payout and financing decisions. Ultimately, the amount of cash that can be paid out to (or financed by) shareholders should follow from the net cash flows that the company's operations generate. It cannot be set independently of a company's strategic plans for future growth, divestments, and acquisitions.

Payouts to Shareholders

For most successful companies, at some point, it becomes virtually impossible to reinvest all the cash they generate. In that case, there is little alternative but to return the cash surplus to shareholders. Although some executives might consider that as a failure to find value-creating investments, it is actually an inevitable consequence for maturing companies with high returns on capital and moderate growth. For example, a company with $1 billion of net operating profit less adjusted taxes (NOPLAT), a return on invested capital of 25 percent, and annual revenue growth of 5 percent needs net investments of only $200 million per year to continue its growth at that rate. That leaves $800 million of surplus cash flow for additional investments or payouts to shareholders. Finding $800 million of new investment opportunities at attractive returns in every year is a challenge in many industries. Reinvesting all of its surplus cash flow in new opportunities at its current return on capital of 25 percent would imply that the company grows revenues by 20 percent each year.

Although their actual returns on capital and growth rates might be different, the implications will eventually be similar for most successful companies: there is no choice but to return substantial amounts of cash to shareholders. Between 2002 and 2014, Procter & Gamble returned $113 billion in dividends and share repurchases to its shareholders, representing more than 90 percent of its net earnings over these years. Even for a company like Procter & Gamble, it would have been close to impossible to reinvest that amount of cash, given that it had already spent some $2 billion per year on R&D and $8 billion on advertising.

There are three basic alternatives for paying out cash surpluses to shareholders: dividend increases, share repurchases, and extraordinary dividends. All three provide a positive signal to the capital market about a company's prospects. The potential negative signal that a cash payout could send is that the company has run out of investment opportunities. This assumes that investors did not already know that the company was generating more cash flow than it could reinvest. However, such cases are extremely rare; investors

[23] We abstract here from any value created by higher leverage, as this value is typically small.

typically anticipate payouts long before managers make that decision, as illustrated by the simple math in our example at the beginning of this section.[24]

Dividends Companies that increase their dividends receive positive market reactions averaging around 2 percent on the day of announcement.[25] For companies that initiate dividend payments, the impact is even greater.[26] In general, investors interpret dividend increases as good news about the company's long-term outlook for future earnings and cash flows. On average, they are right, according to the evidence. Most companies that increase their dividend payout usually do so after strong earnings growth and when they are able to maintain such high levels of earnings in the year following the dividend increase. Companies that start paying dividends for the first time typically continue to experience high rates of earnings growth.

The drawback of increasing dividends is that investors interpret this action as a long-term commitment to higher payouts. Companies, especially in the United States, have created expectations among shareholders that dividends will be cut only in case of severe setbacks. The stock market severely penalizes companies for cutting dividends from customary long-term levels. Between 2004 and 2008, only 5 percent of U.S. listed companies with revenues greater than $500 million cut their dividends, and in almost every case, the company faced a severe financial crisis.

Managers considering dividend increases should be confident that future cash flows from operations will be sufficient to pay for capital expenditures as well as higher dividends. Furthermore, a higher dividend payout could lead to higher taxable income for shareholders, depending on the jurisdiction and their individual tax position. Such shareholders could suffer a tax loss if a company would make unexpected, significant changes to the dividend payout ratio. In other words, dividend increases are useful to handle structural cash surpluses over time, but much less suitable for a one-time surplus payout.

Share repurchases In the early 1980s, share repurchases represented less than 10 percent of cash payouts to shareholders. Since the 1990s, they have gained notable importance as an alternative way to distribute cash to shareholders. By 1999, for example, share repurchases totaled $181 billion, close to the

[24]One such rare example is that of Merck, one of the largest pharmaceutical companies worldwide. In 2000, it announced a $10 billion share repurchase, which led to a 15 percent fall in its share price in the next four weeks (although the initial price reaction was favorable). Investors apparently assumed that Merck had been unable to find interesting R&D opportunities and could no longer maintain its long-term earnings growth target of 20 percent. See J. Pettit, "Is a Share Buyback Right for Your Company?" *Harvard Business Review* 79, no. 4 (2001): 141–147.

[25]See, for example, S. Benartzi, R. Michaely, and R. Thaler, "Do Changes in Dividends Signal the Future or the Past?" *Journal of Finance* 52, no. 3 (1997): 1007–1034; and J. Aharony and I. Swarey, "Quarterly Dividends and Earnings Announcements and Stockholders," *Journal of Finance* 35, no. 1 (1980): 1–12.

[26]P. Healey and K. Palepu, "Earnings Information Conveyed by Dividend Initiations and Omissions," *Journal of Financial Economics* 21, no. 2 (1988): 149–175.

$216 billion in regular dividend payments for companies listed on the New York Stock Exchange.[27] Even in the wake of the stock market downturn in 2000, major companies in different sectors have continued to repurchase shares on a large scale; examples include Unilever, Marks & Spencer, Exxon Mobil, IBM, and Viacom. By now, about 50 to 60 percent of cash distributions to shareholders in the United States are share repurchases.

Investors typically interpret share repurchases positively, for several reasons. First, a share buyback shows that managers are confident that future cash flows are strong enough to support future investments and debt commitments. Second, it signals that the company will not spend its excess cash on value-destroying investments. Third, buying back shares indicates to investors that management believes the company's shares are undervalued. If management itself buys back shares, this effect is reinforced. Research shows that because of this signaling, share prices historically increased 2 to 3 percent on average on the day of announcement for smaller repurchase programs (in which less than 10 percent of shares outstanding were acquired through open-market transactions).[28] However, as repurchases have become a regular payout instrument for many large companies, their signaling effect has probably declined over the years.

These signaling effects should not be confused with value creation for shareholders, as they only reflect higher market expectations of future performance. If the company does not deliver against these higher expectations, the share price will come down again. As is the case for all cash payouts to shareholders, repurchases do not create value for shareholders, because they do not increase the company's cash flows from operations. This is confirmed by empirical evidence that earnings multiples and returns to shareholders are not related to the amount or the form of the cash returns, whether in dividends or via share buybacks (see Exhibit 29.8).[29]

We also find no evidence that managers of larger companies can create value by repurchasing shares when they are undervalued.[30] Managers have inside information and could be in a better position than investors to assess when the company's shares are undervalued in the stock market and to buy these at the right time. Buying the undervalued shares would create value for those shareholders who hold on to them. However, the empirical evidence

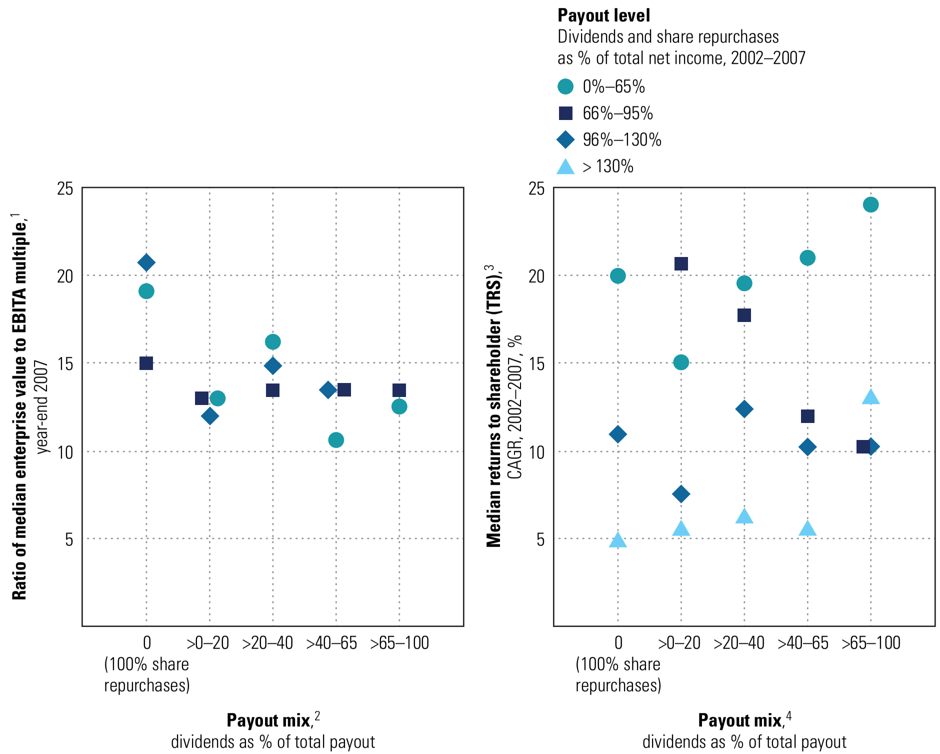
[27]See Pettit, "Is a Share Buyback Right for Your Company?"

[28]In smaller programs, companies typically buy their own shares at no premium or a limited premium in so-called open-market purchases. Larger programs are often organized in the form of tender offers in which companies announce that they will repurchase a particular amount of shares at a significant premium. See, for example, R. Comment and J. Jarrell, "The Relative Signaling Power of Dutch-Auction and Fixed Price Self-Tender Offers and Open-Market Repurchases," *Journal of Finance* 46, no. 4 (1991): 1243–1272; and T. Vermaelen, "Common Stock Repurchases and Market Signaling: An Empirical Study," *Journal of Financial Economics* 9, no. 2 (1981): 138–183.

[29]See B. Jiang and T. Koller, "Paying Back Your Shareholders," *McKinsey on Finance*, no. 39 (2011): 2–7.

[30]See B. Jiang and T. Koller, "The Savvy Executive's Guide to Buying Back Shares," *McKinsey on Finance*, no. 41 (2011): 14–17.

EXHIBIT 29.8 **Value Created by Share Repurchases**



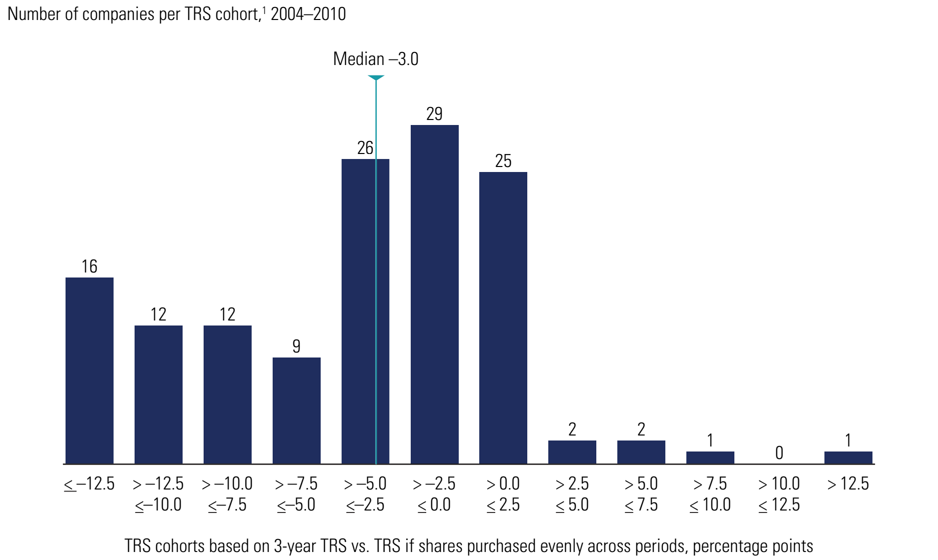
[1] For 279 nonfinancial companies that were in the S&P 500 at the end of 2009, were continuously in operation since 1999, and paid dividends or repurchased shares. EBITA = earnings before interest, taxes, and amortization.

[2] Insufficient data for payout levels of 96–130% at payout mix of >65 to 100% dividends and for payout levels of >130% for all payout mixes.

[3] For 293 nonfinacial companies that were in the S&P 500 at the end of 2009. were continuously in operation since 1999, and paid dividends or repurchased shares. CAGR = compound annual growth rate.

[4] Insufficient data for payout level 66–95% at payout mix of zero dividends (100% share repurchase).

EXHIBIT 29.9 **Relative Performance of Timing Share Repurchases**



[1] Based on 135 S&P 500 companies that repurchased shares from 2004 to 2010.
Source: McKinsey Corporate Performance Analysis Tool.

shows that companies rarely pick the right time to buy back shares.[31] For 2001 through 2010, a majority of the S&P 500 companies bought back shares when prices were high—and few bought shares when prices were low. In fact, the timing of share repurchases by more than three-quarters of S&P 500 companies resulted in lower shareholder returns than a simple strategy of equally distributed repurchases over time would have generated (see Exhibit 29.9).

Nevertheless, there are other good reasons to use share repurchases to pay out cash to shareholders. In contrast to dividend increases, repurchases offer companies more flexibility in adapting their payouts to unexpected investment needs in a volatile economy. Share buyback programs are not seen as long-term commitments and can be adjusted without influencing investor expectations as much as adjustments to regular dividends would. And they offer investors the flexibility to participate or not. This means for institutional investors that they can choose to uphold the amount invested in a stock, for example because of a client mandate or because they are tracking an index, without having to reinvest dividends and incur any transaction costs. Individuals have the option to defer taxes on any capital gains and realize such gains in a more tax-efficient manner, potentially years later. Finally, share buybacks can result

[31] Some academic studies have concluded that companies do, in fact, time their repurchases well. Those findings, however, are driven primarily by smaller companies that make a one-time decision to repurchase shares. Once those smaller companies are excluded, the smart-timing effect disappears.

in lower taxes than dividend payments for investors in countries where capital gains are taxed at lower rates. Because of their flexibility, share repurchases are a very effective way to pay out any cash surpluses that exceed the level of regular dividends.

Extraordinary dividends As an alternative to share repurchases, a company could declare an extraordinary dividend payout, as Microsoft did in 2004 as part of its record $75 billion, four-year cash return program. Microsoft paid out a significant portion in the form of an extraordinary dividend because of its concern that the share repurchase was so massive that it would swamp the liquidity in the market for Microsoft stock. The drawback of extraordinary dividends, compared with share repurchases, is that they offer no flexibility to shareholders and force the cash payout on all of them, regardless of their preferences for capital gains or dividends.

Equity Financing

If a company is facing a cash deficit and has already reached its long-term leverage target, it has little alternative but to raise equity or cut its dividends. As with all payout and financing decisions, this does not create or destroy value in itself. But raising equity and—especially—cutting dividends will send negative signals to investors.

As noted, companies are extremely reluctant to cut dividends to free up funding for new investments, because the stock market typically interprets such reductions as a strong signal of lower future cash flows. Share prices on average decline around 9 percent on the day a company announces dividend cuts or omissions.[32] Furthermore, some investor groups count on dividends being paid out every year. Skipping these dividends will force these investors to liquidate parts of their portfolios, leading to unnecessary transaction costs. Only very compelling growth opportunities might somewhat mitigate the negative price reactions [33] Finally, the amount of funding freed up by cutting dividends is often limited, so dividend cuts alone are unlikely to resolve more substantial funding shortages.

Issuing equity also is likely to lead to a short-term drop in share prices. Typically, share prices decline by around 3 percent on announcements of so-called seasoned equity offerings.[34] Because investors assume that managers have superior insights into the company's true business and financial outlook,

[32]Healey and Palepu, "Earnings Information Conveyed by Dividend Initiations and Omissions."
[33]L. Lang and R. Litzenberger, "Dividend Announcements: Cash Flow Signaling versus Free Cash Flow Hypothesis," *Journal of Financial Economics* 24, no. 1 (1989): 181–192.
[34]See, for example, B. Eckbo and R. Masulis, "Seasoned Equity Offerings: A Survey," in *Handbooks in Operations Research and Management Science* 9, ed. R. Jarrow, V. Maksimovic, and W. Ziemba (Amsterdam: Elsevier, 1995); and C. Smith, "Investment Banking and the Capital Acquisition Process," *Journal of Financial Economics* 15, nos. 1/2 (1986): 3–29.

they believe managers will issue equity only if a company's shares are overvalued in the stock market. Therefore, the share price will likely decrease in the short term on the announcement of an equity issuance, even if it is not actually overvalued. A similar price reaction can be expected for various equity-like instruments, such as preferred stock, convertibles, warrants, and more exotic hybrid forms of capital.

Debt Financing

In principle, the amount of debt that needs to be issued or redeemed follows from a company's actual and targeted capital structure. In contrast to equity financing, issuing or redeeming debt typically does not send strong signals to investors about the company's future cash flows.

When issuing debt, companies commit to fixed future interest payments that can be withheld only at considerable cost. Investors also know that debt is more likely to be issued when management perceives a company's share price to be undervalued. As a result, the issuance of debt typically meets with less negative share price reactions than the issuance of new equity. Empirical evidence shows that the price reaction is typically flat.[35]

Redeeming debt does not meet with significant stock market reactions, either, unless the company is in financial distress. In that case, buying back bonds can send a positive signal to the equity markets. For distressed companies, bond prices go up and down with the enterprise value, just as share prices do. A bond buyback could therefore be a credible signal that management believes the bonds are undervalued (and because in this case bonds are similar to equity, this must also mean that shares are undervalued). For example, when the Swiss-Swedish engineering company ABB announced a €775 million bond buyback in July 2004, its share price increased 4 percent on the day of the announcement. The stock market apparently saw the buyback as further evidence that the company was on a trajectory to recover from an earlier financial crisis.

CREATING VALUE FROM FINANCIAL ENGINEERING

Financial engineering means different things to different people. We define it as managing a company's capital structure with financial instruments beyond straight debt and equity. It typically involves more complex and sometimes

[35]See, for example, W. Mikkelson and M. Partch, "Valuation Effects of Security Offerings and the Issuance Process," *Journal of Financial Economics* 15, nos. 1/2 (1986): 31–60; and Smith, "Investment Banking and the Capital Acquisition Process."

even exotic instruments such as synthetic leasing, mezzanine finance, securitization, commodity-linked debt, commodity and currency derivatives, and balance sheet insurance.

In general, capital markets typically do a good job of pricing financial instruments, and companies will have difficulty boosting their share prices by accessing so-called cheap funding, however complex the funding structures are. Nevertheless, financial engineering can create shareholder value under specific conditions, both directly (through tax savings or lower costs of funding) and indirectly (for example, by increasing a company's debt capacity so it can raise funds to capture more value-creating investment opportunities). However, such benefits need to outweigh any potential unintended consequences that inevitably arise with the complexity of financial engineering.

This section considers three of the more common tools of financial engineering: derivative instruments that transfer company risks to third parties, off-balance-sheet financing that detaches funding from the company's credit risk, and hybrid financing that offers new risk/return financing combinations.

Derivative Instruments

With derivative instruments, such as forwards, swaps, and options, a company can transfer particular risks to third parties that can carry these risks at a lower cost. For example, some airlines hedge their fuel costs with derivatives to be less exposed to sudden changes in oil prices. Of course, this does not make airlines immune to prolonged periods of high oil prices, because the derivative positions must be renewed at some point. But derivatives at least give the airlines some time to prepare business measures such as cost cuts or price increases.

Derivatives are not relevant to all companies, and there are many examples where the complexity around the use of derivatives has been badly managed.[36] In general, derivatives are useful tools for financial managers when risks are clearly identified, derivative contracts are available at reasonable prices because of liquid markets, and the total risk exposures are so large that they could seriously harm a corporation's health.

Off-Balance-Sheet Financing

A wide range of instruments fall under the umbrella of off-balance-sheet financing. These include operating leases, synthetic leases, securitization, and project finance. Although the variety of these instruments is huge, they have a common element: companies effectively raise debt funding without carrying the debt on their own balance sheets.

[36] In the 1990s, some high-profile scandals—for example, at Metallgesellschaft, and Orange County, California—underlined the need for such caution.

In most cases, off-balance-sheet financing is used to capture tax advantages. For example, many of the largest hotel companies in the United States don't own most of the hotels they operate. Instead, the hotels themselves are owned by other companies, often structured as partnerships or real estate investment trusts (REITs). Unlike corporations, partnerships and REITs don't pay U.S. income taxes; taxes are paid only by their owners. Therefore, in the United States, placing hotels in partnerships and REITs eliminates an entire layer of taxation. With ownership and operations separated in this manner, total income taxes are lower, so investors in the ownership and operating companies are better off as a group because their aggregate cash flows are higher.

However, these deals are very complex, because they need to ensure that the interests of the owner and management company are aligned. For example, the deals need to define in advance how the REITs and the hotel companies will make decisions about renovating the hotels, terminating the leases, and other situations where the interests of both parties could conflict. Unfortunately, such potential conflicts are sometimes overlooked or are simply too complex to cover in advance. The owners of Mervyn's (a clothing retail chain in the United States) tried something similar in 2004 but failed to align the interests of the real estate company and the operating company.[37] While Mervyn's had plenty of other problems, this structure exacerbated the difficulty of improving the company's performance. Mervyn's filed for bankruptcy in 2008. All its stores were closed and its assets liquidated in 2009.

In other cases, off-balance-sheet financing aims primarily at enabling a company to attract debt funding on terms that would have been impossible to realize for traditional forms of debt. A well-known example is the large-scale securitization of customer receivables undertaken by Ford Motor Company and General Motors. Both companies sold large sums of their receivables to fully owned but legally separate entities.[38] Because the receivables represented relatively sound collateral, these entities had better credit ratings and credit terms than their parent companies. This effectively enabled both companies to tap large sums of debt for investments that otherwise would have been difficult to obtain at similar terms—although one can question whether the investments made by Ford and GM resulted in any value creation.

Other successful examples include the use of project financing for building and running large infrastructure projects such as gas pipelines, toll bridges, and tunnels. Companies (or sometimes governments) in emerging markets and with low credit ratings may have difficulty attracting large sums of debt. But they can use project financing to raise cash for the initial investments; once the

[37] Emily Thornton, "What Have You Done to My Company?" *BusinessWeek*, December 8, 2008, 40–44.
[38] These represent examples of a so-called special-purpose entity (SPE), or, as it is referred to under U.S. Generally Accepted Accounting Principles, a variable-interest entity (VIE).

infrastructure asset is operational, the interest and principal on the debt are paid to the lender directly from the cash flows from the asset's revenues. In this way, the debt service is assured, even if the company itself goes bankrupt.

Some managers find off-balance-sheet financing attractive because it reduces the amount of assets shown on the balance sheet and increases the reported return on assets. That is not a good reason to do it. Investors will see through accounting representations, as discussed in Chapter 5. Furthermore, following the latest requirements of U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS), special-purpose entities for off-balance-sheet financing need to be fully consolidated and shown on the balance sheet.

Hybrid Financing

Hybrid financing involves forms of funding that share some elements of both equity and debt. Examples are convertible debt, convertible preferred stock, and callable perpetual debt. In particular, issuance of convertible debt has seen strong growth over the past decades, and the amount of convertible debt outstanding surpassed €400 billion in 2014.[39]

Convertible debt (debt that may be exchanged for common stock in a given proportion within or after a specified period) can make sense when investors or lenders differ from managers in their assessment of the company's credit risk.[40] When the discrepancy is great, it may become difficult or even impossible to achieve agreement on the terms of credit. But a company's credit risk has less impact on credit terms if the debt is convertible. The key reason is that higher credit risk makes the straight-debt component of the convertible less attractive and the warrant component more attractive, so the two components balance each other to an extent. Overall, convertible debt is less sensitive to differences in credit risk assessment and may therefore facilitate agreement on credit terms that are attractive to both parties. This also explains why high-growth companies use this instrument much more than other companies; they usually face more uncertainty about their future credit risk.

Do not issue convertible debt just because it has a low coupon. The coupon is low because the debt also includes a conversion option. It is a fallacy to think that convertible debt is cheap funding. Also avoid issuing convertible debt simply because it is a way to issue equity against the current share price at some point in the future when share prices will be much higher. That future value is already priced into the conversion options. Furthermore, if the company's share price does not increase sufficiently, the convertible debt will not

[39] Bank for International Settlements, *BIS Quarterly Review*, September 2014.
[40] See M. Brennan and E. Schwartz, "The Case for Convertibles," *Journal of Applied Corporate Finance* 1, no. 2 (1988): 55–64.

be converted to equity, and the company will end up with interest-bearing debt instead.

A COMPREHENSIVE CASE EXAMPLE

This section provides a comprehensive case example of the four-stage approach to developing a capital structure, describing each of the stages in detail.

A company called CashWise is planning for its capital structure over the 2015–2020 period (see Exhibit 29.10). In 2014, it realized sales of €10 billion per year and a healthy operating margin on sales of 15 percent with a pretax ROIC of 30 percent. CashWise had a BBB– credit rating and an EBITA-to-interest coverage ratio of 6.1 in 2014.

Stage 1: Project and Test Operating Cash Flows

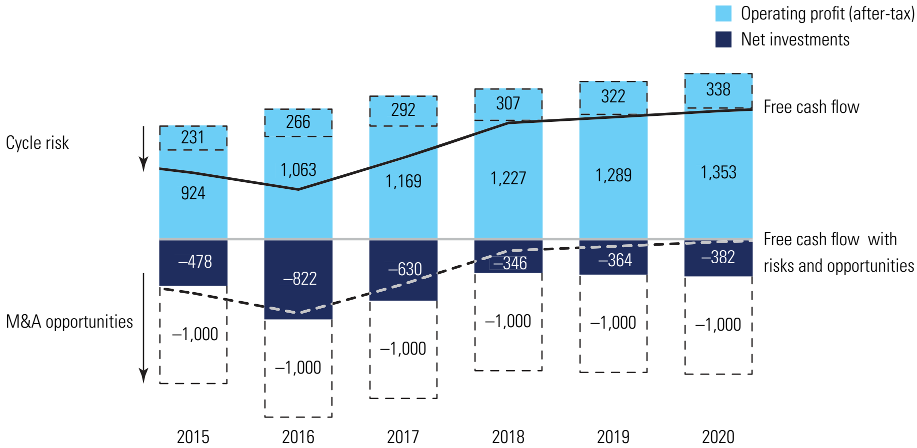
Based on a company's strategy and business plans, estimate the expected future cash flows from operations and the requirements for future capital expenditures and acquisitions, net of any planned divestments. CashWise has developed investment plans for the next six years to boost its sales growth from a current level of 3.5 percent per year to an average of more than 8 percent per year until 2020. The net investment requirements are accordingly high, amounting to more than €3 billion in net property, plant, and equipment (net PP&E) and working capital over that same period.

Understand the uncertainty around the cash flow projections. The more cash flows fluctuate across the business cycle, the more you should aim for a robust target capital structure. As an example, try to estimate how quickly and how far earnings have dropped over the past years in a typical downturn. For example, in CashWise's business, a typical downturn sees an operating-profit decline of around 20 percent, based on an analysis of its earnings fluctuations over the past 10 years.

Assess the need for any financial buffers for unexpected acquisition and investment opportunities. CashWise is looking out for interesting acquisition opportunities among its smaller competitors. A meaningful acquisition of one of the smaller peers would require an investment outlay of around €1 billion. The capital structure should provide enough flexibility to allow for such an add-on acquisition.

Project the cash flows from operations and investments for the base-case scenario, and test these against a stretched scenario with downside risks and additional investments. In the base-case scenario, CashWise is investing €3 billion in growth until 2020, with growth levels peaking at 15 percent in 2016. As Exhibit 29.10 shows, the operating cash flows alone are more than sufficient to

EXHIBIT 29.10 **CashWise: Projections of Operational Cash Flows—Expectations, Risks, and Opportunities**



€ million	2014	2015	2016	2017	2018	2019	2020
Income statement							
Revenues	10,000	11,000	12,650	13,915	14,611	15,341	16,108
Cost of goods sold, SG&A	(8,500)	(9,350)	(10,753)	(11,828)	(12,419)	(13,040)	(13,692)
Operating profit, EBIT	1,500	1,650	1,898	2,087	2,192	2,301	2,416
Interest on existing debt	(245)	(244)	(240)	(230)	(228)	(225)	(222)
Interest on excess cash	–	14	10	20	63	110	161
Profit before taxes	1,255	1,420	1,667	1,877	2,027	2,186	2,355
Taxes[1]	(402)	(426)	(500)	(563)	(608)	(656)	(707)
Net income	853	994	1,167	1,314	1,419	1,530	1,649
Invested capital							
Working capital	1,500	1,628	1,872	2,059	2,162	2,271	2,384
Net PP&E	3,500	3,850	4,428	4,870	5,114	5,369	5,638
Invested capital	5,000	5,478	6,300	6,930	7,276	7,640	8,022
Cash flow statement							
Operating profit, EBITA		1,650	1,898	2,087	2,192	2,301	2,416
Taxes on operating profit		(495)	(569)	(626)	(657)	(690)	(725)
(Increase) decrease in working capital		(128)	(244)	(187)	(103)	(108)	(114)
(Increase) decrease in invested capital		(350)	(578)	(443)	(244)	(256)	(268)
Free cash flow		677	507	831	1,188	1,247	1,309
Key ratios, %							
Revenue growth	3.5	10.0	15.0	10.0	5.0	5.0	5.0
Operating margin	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Pretax ROIC	30.0	30.1	30.1	30.1	30.1	30.1	30.1

[1] Corporate tax rate of 30% assumed from 2015 onward.

support the planned level of investments for growth. Even in a stretched scenario, with 20 percent lower operating profits, the cumulative net cash flows generated by the operations could easily fund at least one acquisition of €1 billion.

Stage 2: Develop a Capital Structure Target

Set a capital structure target based on the company's risk profile and risk appetite. In the CashWise example, the CFO wants to develop a capital structure that justifies a single-A credit rating. This rating target would require an EBITA-to-interest coverage ratio of approximately 9.5 in CashWise's industry. In addition, the CFO wants the structure to be robust enough in a typical business downturn for the company to retain at least a minimum rating of BBB+, giving it unrestricted access to debt markets. For the structure to be that robust, CashWise's interest coverage should not drop below 7.5, even in the face of a 20 percent earnings decline. The CFO also wants enough flexibility to make an acquisition of around €1 billion and retain the minimum credit rating.[41] For other credit ratios, no targets are set at the moment, but if any covenants are in place for existing debt, these requirements should, of course, be observed when setting any target ratios.

Stage 3: Estimate Cash Flow Surplus or Deficit

Project the company's financing cash flows for the base-case scenario, given its existing debt and dividend commitments (see Exhibit 29.11). In these as-is projections, any cash flow deficit or surplus is simply balanced by additional short-term debt or excess cash, respectively. By 2020, €335 million of CashWise's existing debt needs to be paid down, with a peak repayment of €150 million in 2017. CashWise has established a fairly conservative policy of paying out about 30 percent of profits in shareholder dividends. Following the as-is projections, CashWise would have €2.3 billion of excess cash in 2020, leading to a net debt position below €1 billion. As a result, CashWise would significantly overshoot its targeted (and minimum) coverage ratios. This is summarized in Exhibit 29.12, showing CashWise's projected debt coverage over time, relative to the estimated credit ratings for different combinations of EBITA and net debt, including its target A and minimum BBB+ ratings.[42] Moving from the bottom right to the upper left in the chart leads to stronger ratings.

[41] We assume that this flexibility for acquisitions is not required in an earnings downturn scenario.
[42] As discussed in the previous section, more factors drive a credit rating than EBITA and net debt alone. But assuming other key factors such as the company's business risk and management quality are constant, the ratio of EBITA to net debt or EBITA to interest is a reasonable basis for estimating how a company's credit rating evolves over time.

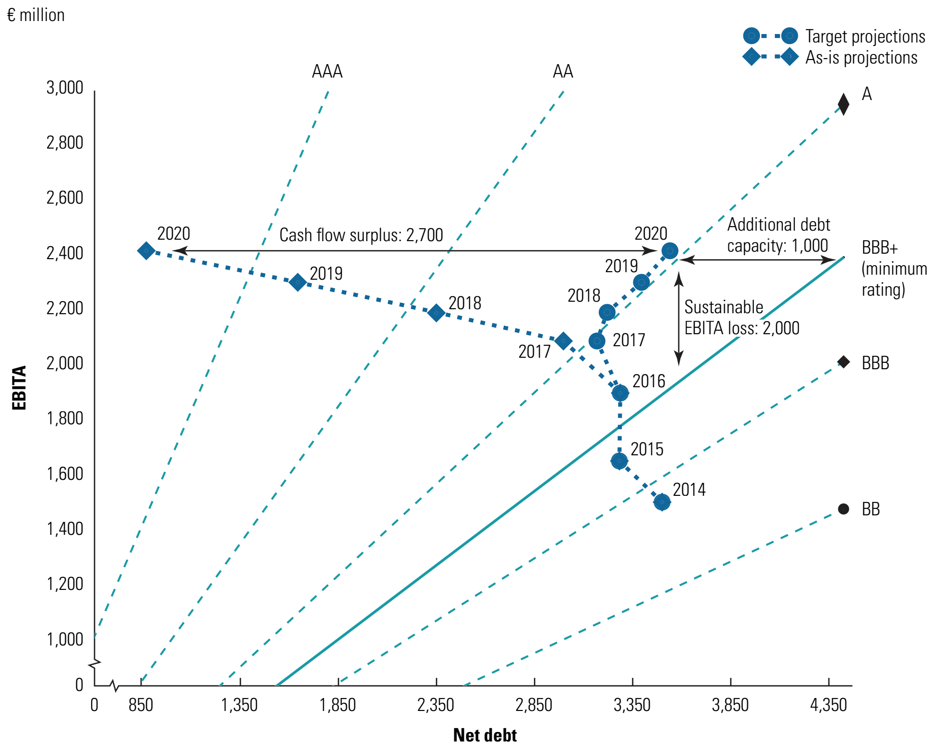
EXHIBIT 29.11 **CashWise: Projections of As-Is Capital Structure**

	2014	2015	2016	2017	2018	2019	2020
Balance sheet							
Working capital	1,500	1,628	1,872	2,059	2,162	2,271	2,384
Net PP&E	3,500	3,850	4,428	4,870	5,114	5,369	5,638
Invested capital	5,000	5,478	6,300	6,930	7,276	7,640	8,022
(Excess cash)	–	(198)	(143)	(283)	(905)	(1,578)	(2,295)
Short-term debt	–	–	–	–	–	–	–
Existing debt	3,500	3,480	3,430	3,280	3,255	3,220	3,165
Equity	1,500	2,196	3,013	3,933	4,926	5,997	7,152
Investor funds	5,000	5,478	6,300	6,930	7,276	7,640	8,022
Cash flow statement							
Free cash flow		677	507	831	1,188	1,247	1,309
Existing debt repayment		(20)	(50)	(150)	(25)	(35)	(55)
After-tax interest on existing debt		(171)	(168)	(161)	(159)	(158)	(155)
Dividends at current payout ratio		(298)	(350)	(394)	(426)	(459)	(495)
Excess cash investment		(198)	55	(140)	(622)	(672)	(717)
After-tax interest on excess cash		10	7	14	44	77	112
Short-term debt issuance (repayment)		–	–	–	–	–	–
After-tax interest on net short-term debt		–	–	–	–	–	–
Cash flow surplus (deficit)		0	0	0	0	0	0
Dividends increase		–	–	–	–	–	–
Equity issuance (repurchases)		–	–	–	–	–	–
Extraordinary		–	–	–	–	–	–
Cash flow (surplus) deficit		–	–	–	–	–	–

Estimate the company's future cash flow surplus for shareholders when it would move to its capital structure targets set in stage 2. For the base-case projections of EBITA, Exhibit 29.12 plots the level of net debt that leads to the targeted A credit rating. In these target projections, CashWise ends up with a net debt position of around €3.5 billion in 2020—almost €2.7 billion more than in the as-is projections. At this targeted level of debt, CashWise could pay out a cash flow surplus to its shareholders of up to €2.7 billion as of 2020.

But where would CashWise stand in terms of flexibility with €3.5 billion of debt in 2020? How would it get along if the business were to face tighter margins? How much debt could it raise to fund an acquisition if an opportunity arose in the next few years? To answer these questions, we could make explicit financial projections under one or more stretched scenarios, as done in the example in the beginning of this chapter. In an alternative approach, we can use Exhibit 29.12 to assess the flexibility of CashWise's target capital structure. As the vertical distance to the minimum rating line indicates, CashWise has sufficient flexibility to withstand a 20 percent decline in EBITA from 2017 onward so that it would still be rated BBB+ across the cycle. Following the horizontal distance to the same rating line, there is also ample flexibility to maintain such a minimum rating even if the company raised some

EXHIBIT 29.12 **CashWise: Capital Structure Coverage Trajectories**



€1 billion of new debt for a potential acquisition—in addition to any debt capacity in the acquisition target itself.[43] As the €3.5 billion net debt target for 2020 leaves CashWise with sufficient flexibility, the CFO decides to prepare for paying out €2.4 billion to shareholders over the course of four years, starting in 2017.[44]

Stage 4: Decide on Surplus Payout and Deficit Financing

Decide in more detail which tactical instruments to use and when, in order to move toward the targeted trajectory in Exhibit 29.12. How and when should CashWise return the cash flow surplus to its shareholders? Exhibit 29.13 shows

[43]To be precise, €1 billion of debt capacity is available to finance the equity value of an acquisition, assuming that any debt would be supported by the acquisition's own operations.

[44]CashWise plans to pay out at €2.4 billion to shareholders, less than the projected cash flow surplus of €2.7 billion in 2020. The reason is that CashWise starts with significant shareholder payouts and corresponding increases in debt well before 2020. As a result, it faces higher cash outflows for interest expenses, somewhat reducing the cash flow surplus in later years.

EXHIBIT 29.13 **CashWise: Projections of Targeted Capital Structure**

€ million

	2015	2016	2017	2018	2019	2020	Cumulative
Balance sheet							
Working capital	1,628	1,872	2,059	2,162	2,271	2,384	
Net PP&E	3,850	4,428	4,870	5,114	5,369	5,638	
Invested capital	5,478	6,300	6,930	7,276	7,640	8,022	
(Excess cash)	(198)	(143)	(112)	(35)	–	–	
Short-term debt	–	–	–	–	175	375	
Existing debt	3,480	3,430	3,280	3,255	3,220	3,165	
Equity	2,196	3,013	3,762	4,056	4,245	4,482	
Investor funds	5,478	6,300	6,930	7,276	7,640	8,022	
Cash flow statement							
Free cash flow	677	507	831	1,188	1,247	1,309	
Existing debt repayment	(20)	(50)	(150)	(25)	(35)	(55)	
After-tax interest on existing debt	(171)	(168)	(161)	(159)	(158)	(155)	
Dividends at current payout ratio	(298)	(350)	(394)	(426)	(459)	(495)	
Excess cash investment	(198)	55	31	77	35	–	
After-tax interest on excess cash	10	7	5	2	–	–	
Short-term debt issuance (repayment)	–	–	–	–	175	200	
After-tax interest on net short-term debt	–	–	–	–	(9)	(18)	
Cash flow surplus (deficit)	0	(0)	163	656	796	787	
Dividends increase	–	–	(63)	(56)	(46)	(37)	(202)
Equity issuance (repayment)	–	–	(100)	(600)	(750)	(750)	(2,200)
Extraordinary dividends	–	–	–	–	–	–	–
Cash flow (surplus) deficit	–	–	(163)	(656)	(796)	(787)	(2,402)

the projections of CashWise's financial statements, including the following payout measures:

- *Increasing regular dividends:* CashWise is cautious about increasing dividends, going for a limited increase from 30 to 35 percent of net income as of 2017. Thus, CashWise retains sufficient flexibility to cover any unforeseen business losses without having to cut dividends. By the regular dividend increase, it can pay out an additional €200 million to shareholders over the next five years.
- *Repurchasing shares:* CashWise decides to return the bulk of the excess cash in a €2.2 billion share repurchase program, starting in 2017. The repurchase provides more flexibility than dividends for CashWise to defer or decrease the payout depending on CashWise's future performance. Note that until 2017, there is no need to return additional cash to shareholders, because CashWise's investments for growth absorb most of its cash flow, and it first needs to improve its debt coverage. As a result, CashWise still has some time to make its final decision on how exactly to adjust its capital structure.

SUMMARY

Although a poorly managed capital structure can lead to financial distress and value destruction, capital structure is not a key value driver. For companies whose leverage is already at reasonable levels, the potential to add value is limited, especially relative to the impact of improvements in returns on invested capital and growth. Rather than fine-tuning for the optimal capital structure, managers should make sure the company has enough financial flexibility to support its strategy, while at the same time minimizing the risk of financial distress.

30

Investor Communications*

The value of investor communications is a subject of considerable controversy. Some executives, practitioners, and academics argue that actively handling relations with investors is a waste of management time and has no effect on a company's share price. Others have unrealistic expectations, assuming that you can talk up your company's stock, and, if your investor relations staff is really sharp, it can tell you why the share price went down by 1.2 percent yesterday.

We fall somewhere in between. It's virtually impossible to interpret short-term price movements with any useful insights. And even if you could talk up your share price beyond its intrinsic value, you probably shouldn't. Nevertheless, good investor communications can ensure that your share price doesn't get out of line with its intrinsic value, can build a base of loyal investors, and can ensure that executives don't make poor strategic decisions based on misunderstanding what investors are saying to them. Too often, however, executives don't know how to interpret what they are hearing from investors, because they are listening to the wrong investors.

Good investor communications is about building relationships with the right kinds of investors and communicating to them at their level. It's also about being selective about which sell-side analysts to focus on, not being overly concerned with investors who have a short-term orientation, and not being overly occupied with media coverage of your company. Finally, it's as much about executives listening to the right investors as it is about delivering the company's message to investors.

This chapter also deals with two questions linked to investor communications. First, should companies provide earnings guidance? There is no evidence that companies benefit from the practice. Similarly, should companies

*Special thanks to Robert Palter and Werner Rehm for their support and insights for this chapter. We drew heavily on their article "Communicating with the Right Investors," *McKinsey on Finance* (Spring 2008): 1–4.

be concerned about meeting or beating consensus earnings forecasts? Again, the evidence shows that performance (return on invested capital [ROIC] and growth) is more important than whether a company meets the consensus earnings forecast.

OBJECTIVES OF INVESTOR COMMUNICATIONS

Good investor communications must be founded on the right objectives. Achieving the highest-possible share price through investor communications is not one of them. Instead, the overriding objective of investor communications should be to align a company's share price with management's perspective on the intrinsic value of the company.

When a gap forms between a company's market value and its intrinsic value, all the company's stakeholders are put at a disadvantage. If the share price rises too high and exceeds the company's intrinsic value, the company's real performance will eventually become evident to the market, and the price will fall. When that decline occurs, employee morale will suffer, and management will have to face a concerned board of directors who may not understand why the price is falling so far and so fast.

A share price that's too high may also encourage managers to keep it high by adopting short-term tactics, such as deferring investments or maintenance costs, which will hamper value creation in the long run. Conversely, a share price that is too low has additional drawbacks, especially the threat of takeover. Furthermore, an undervalued stock makes paying for acquisitions with shares an unattractive option and may demoralize managers and employees.

A second objective of investor communications is to develop support from a group of sophisticated intrinsic investors who thoroughly understand the company's strategies, strengths, and weaknesses—and who are in a position to better distinguish between the shorter and longer term. These investors will also be likely to purchase shares on short-term dips in the share price.

The final objective is gaining intelligence about your customers, competitors, and suppliers. The best investors will be talking regularly with these groups. Such investors may give senior management information that is more objective than the results of the company's own research efforts.

INTRINSIC VALUE VS. MARKET VALUE

Senior executives often claim that the stock market undervalues or "doesn't appreciate" their company. They say this not just in public, where you would expect them to, but also in private. They truly believe that if only they had different investors, or if only the investors or analysts understood their company better, the company's share price would be higher. Yet often these senior executives have not performed an objective outside-in valuation of their company, viewing it through the lens of a sophisticated investor. Their optimistic belief is based on a superficial comparison of price-to-earnings ratios (P/Es) or a stray comment by an analyst that the shares are undervalued.

Any good strategy must begin with an honest assessment of the situation, and a strategy for investor communications is no different. It should start with an estimate of the size of the gap, if any, between management's view of the company's intrinsic value and the stock market value. In practice, we typically find that no significant gap exists, or that any gap can be explained by the company's historical performance relative to peers or by the way the market is valuing the entire industry. Let's illustrate with a disguised example.

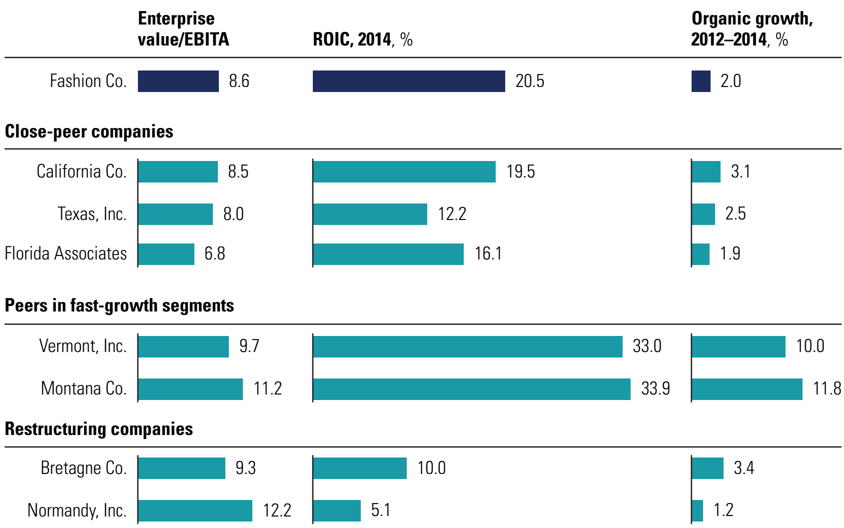
A large apparel manufacturer we'll call Fashion Co. earns a return on invested capital (ROIC) of about 20 percent, but its product lines are in slow-growth segments, so its revenue growth has been low. Fashion Co. recently adopted a strategy to buy small companies in faster-growing areas of the industry with higher ROICs—intending to apply its manufacturing and distribution skills to improve the performance of the acquired companies. Currently, 18 months since the company made its first acquisitions under this strategy, Fashion Co. derives 5 percent of its revenues from the fast-growth segments.

Fashion Co.'s managers were concerned that the company's P/E trailed the P/Es of many companies with which it compared itself. They wondered whether such factors as the company's old-fashioned name or the small number of analysts covering the industry were the cause of the low value.

We began analyzing the apparent discrepancy by assessing Fashion Co.'s value relative to companies it considered peers. Some of the supposed peers were 100 percent involved in the fast-growth segments, far more than Fashion Co.'s 5 percent revenue stream from them. When segmenting Fashion Co.'s peers, we found that its earnings multiple—enterprise value divided by earnings before interest, taxes, and amortization (EBITA)—was in line with those of its close peers but behind those of the companies in the fast-growing segment (see Exhibit 30.1). A third set of companies had high multiples because of current low earnings due to restructuring. Exhibit 30.1 also shows that Fashion Co. and its closest peers had lower ROICs and much lower growth rates than the fast-growth companies. So, based on recent performance, Fashion Co.'s value was aligned with its performance relative to its closest peers.

Next, we reverse engineered the share price of Fashion Co. and its peers by building a discounted-cash-flow (DCF) model for each company and estimating what levels of future performance would be consistent with the current share price. We found that if Fashion Co. increased its revenues at 2 percent per year and maintained its most recent level of margins and capital turnover, its DCF value would equal its current share price. This growth rate was in line with the implicit growth of its closest peers and lower than the companies in the fast-growing segment.

EXHIBIT 30.1 **Fashion Co.: Valuation in Line with Close Peers**



WHICH INVESTORS MATTER?

Does it matter who your investors are? It is not clear whether one investor base is better than another in the sense of helping to align the share price with a company's intrinsic value. But understanding a company's investor base can give managers insights that might help them anticipate how the market will react to important events and strategic actions, as well as help managers improve the effectiveness and efficiency of their investor relations activities.

Common approaches to understanding institutional investors are not helpful in answering this question.[1] For example, sometimes investors are labeled as growth or value investors, depending on the type of stocks or indexes they invest in. Most growth and value indexes, like that of Standard & Poor's, use market-to-book ratios to categorize companies as either value or growth: companies with high market-to-book ratios are labeled growth companies, and those with low market-to-book ratios are value companies. However, growth is only one factor driving differences in market-to-book ratios. In fact, as discussed in more detail in Chapter 5, we have found no difference in the distribution of growth rates between so-called value and growth stocks.[2] As we would

[1]Retail investors do not qualify, because they rarely matter when it comes to influencing a company's share price. In spite of collectively holding around 40 percent of U.S. equity, they do not move prices, because they do not trade very much. The real drivers of share prices are institutional investors, who manage hedge funds, mutual funds, or pension funds and can hold significant positions in individual companies.
[2]See T. Koller and B. Jiang, "The Truth about Growth and Value Stocks," *McKinsey on Finance*, no. 22 (Winter 2007): 12–15.

expect, differences in market-to-book ratios derive mainly from differences in return on capital. The median return on capital for so-called value companies was 15 percent, compared with 35 percent for the growth companies. So the companies classified as growth did not grow faster, but they did have higher returns on capital. That's why a modestly growing company, like the tobacco company Philip Morris International, ends up on the growth stock list.

Many executives mistakenly believe they can increase their share price (and valuation multiple) by better marketing their shares to growth investors, because growth investors tend to own shares with higher valuation multiples. But the causality runs in reverse: in our analysis of companies whose stock prices have recently increased enough to shift them from the value classification to the growth classification, what precipitated the rise in their market value was clearly not an influx of growth investors. Rather, growth investors responded to higher multiples, moving into the stock only after the share price had already risen.

Investor Segmentation by Strategy

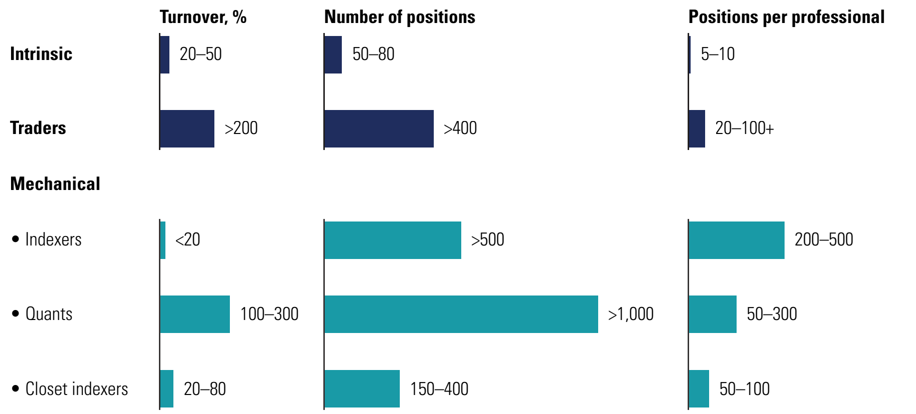
A more useful way to categorize and understand investors is to classify them by their investment strategy. Do they develop a view on the value of a company, or do they look for short-term price movements? Do they do extensive research and make a few big bets, or do they make lots of small bets with less information? Do they build their portfolios from the bottom up, or do they mirror an index?

Using this approach, we classify institutional investors into three types: intrinsic investors, traders, and mechanical investors.[3] These groups differ in their investment objectives and the way they build their portfolios. As a result, their portfolios vary along several important dimensions, including turnover rate, positions held, and the number of positions held per investment professional (see Exhibit 30.2).

Intrinsic investors take positions only after undertaking rigorous due diligence of a company's inherent ability to create long-term value. This scrutiny typically takes more than a month. The depth of the intrinsic investor's research is evidenced by the fact that such investors typically hold fewer than 80 stocks at any time, and their investment professionals manage only a few positions each, usually between five and 10. Portfolio turnover is low, as intrinsic investors typically accept that price-to-value discrepancies may persist for up to three or four years before disappearing. We estimate that these investors hold around 20 to 25 percent of institutional U.S. equity and contribute 10 percent of the trading volume in the U.S. stock market.

[3] R. Palter, W. Rehm, and J. Shih, "Communicating with the Right Investors," *McKinsey on Finance* (Spring 2008): 1–4.

EXHIBIT 30.2 **Investors Segmented by Investment Strategies**



Examples of intrinsic investors include the Dodge and Cox Stock Fund. In September 2014, it held shares in 69 companies and had a turnover rate of only 7 percent. From the hedge fund world, Maverick Capital and Hermes Capital are good examples of intrinsic investors. Lee Ainslie, Maverick's managing director, is proud that Maverick holds only five positions per investment professional, and many of his staff have followed a single industry for 10 years or more.[4]

Traders seek profits by betting on short-term movements in share prices, typically based on announcements about the company or technical factors, like the momentum of the company's share price. The typical investment professional in this segment has 20 or more positions to follow and trades in and out of them quickly to capture small gains over short periods—as short as a few days or even hours. We estimate that traders own about 35 to 40 percent of institutional equity holdings in the United States.

Traders don't need to develop a point of view on a company's intrinsic value, just on whether its shares will go up or down in the very short term. For example, traders may develop a view that a drug company is about to announce good news about a product trial that will boost the company's share price. The trader would buy the shares, wait for the announcement and the subsequent rise in the share price, and then immediately unwind the position. Some traders are in and out of the same stock many times during the year. This does not mean traders don't understand the companies or industries they invest in; on the contrary, they follow the news about these companies closely and often approach companies directly, seeking nuances or insights that could

[4]R. Dobbs and T. Koller, "Inside a Hedge Fund: An Interview with the Managing Partner of Maverick Capital," *McKinsey on Finance*, no. 19 (Spring 2006): 6–11.

matter greatly in the short term. However, they don't take a view on companies' long-term strategies and business performance.

Mechanical investors control about 35 to 40 percent of institutional equity in the United States. They make decisions based on strict criteria or rules. Index funds are the prototypical mechanical investor, merely building their portfolios by matching the composition of an index such as the S&P 500. Another group of mechanical investors are the so-called quantitative investors, who use mathematical models to build their portfolios and make no qualitative judgments on a company's intrinsic value. Finally, closet indexers, although they are promoted as active managers, have portfolios that look like an index. Basing their portfolio on an index and making some adjustments, they hold a great many stocks: an investment professional in this category holds some 50 to 100 positions and hasn't the time to do in-depth research on them.[5] By contrast, intrinsic investors know every company in their portfolios in depth and build their portfolios from scratch, without taking their cue from any index.

Targeting Communications by Segment

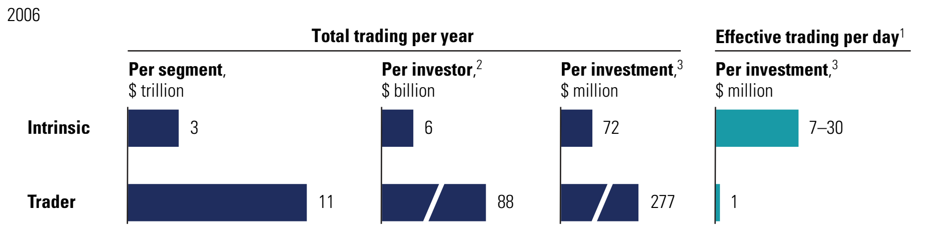
Which of these investors matter most for the stock price? Analyzing the trading behavior of all three investor groups in more detail, we find support for the idea that intrinsic investors are the ultimate drivers of long-term share prices.

Exhibit 30.3 helps make the case, although at face value, traders show up as the most likely candidates for driving share price in the market. They own 35 to 40 percent of the institutional U.S. equity base, and as the first two columns show, they are much more active in the market than intrinsic and mechanical investors. Their overall transaction volume is made up of many more trades—of which many are trades in the same stock within relatively short time periods. The average trader fund bought and sold over $80 billion worth of shares in 2006, more than 12 times the amount traded by the typical intrinsic or mechanical investor. Similarly, as shown in the third column, the typical trader also buys or sells around $277 million in each equity stock he or she holds—far more per stock than the average intrinsic investor. Mechanical investors trade the lowest amount per stock, reflecting the high number of stocks they hold and their relatively infrequent trading.

But the last column in the exhibit, which shows the value of effective daily trading per investment on the days that an investor traded at all, is the figure that informs the real impact of each investor group on share prices in the market. Effective daily trading is highest by far among intrinsic investors: *when* intrinsic investors trade, they buy or sell in much larger quantities than traders or mechanical investors. Although they trade much less

[5]For more on closet index funds, see M. Cremers and A. Petajist, "How Active Is Your Fund Manager? A New Measure That Predicts Performance" (AFA 2007 Chicago Meetings paper, American Finance Association, January 15, 2007).

EXHIBIT 30.3 **Intrinsic Investors Have Greatest Impact on Share Price**



[1] Trading activity in segment per day that trade is made.
[2] Per investor in segment.
[3] Per investor in segment per investment.

Source: R. Palter, W. Rehm, and J. Shih, "Communicating with the Right Investors," *McKinsey on Finance*, no. 27 (Spring 2008): 1–5.

frequently than the other investor groups, they hold much larger percentages of the companies in their portfolios, so when they do trade, they can move the prices of these companies' shares. Ultimately, therefore, intrinsic investors are the most important investor group for setting prices in the market over the longer term.

As a result, companies should focus their investor communications effort on intrinsic investors. If intrinsic investors' view of the value of your company is consistent with your own view, the market as a whole is likely to value your company as you do, because of the role intrinsic investors play in driving share prices. Their understanding of long-term value creation also means they're more likely than other investors to hold on to a stock, supporting the management team through periods of short-term volatility (so long as they believe these periods do not reflect a material change in the underlying value of the company). These are the investors to whom you should listen when you want to understand what the market thinks of your company.

A conundrum for companies is how to treat closet indexers, because they may be some of a company's largest investors. Remember, a closet indexer is likely to have more than 200 different companies in his or her portfolio, and most of this investor's holdings are in proportion to the company's size in an index such as the S&P 500. Our first step is to examine whether the closet indexer is significantly over- or underweight in any company or industry. If the answer is yes, we move them to the intrinsic category with respect to that company or industry. If not, we keep the investor categorized with the closet indexers.

CEOs and CFOs have substantial demands on their time, and investors worry when they spend too much time with investors instead of running the company. Just as a CEO has to decide which customers to spend time with, CEOs and CFOs must proactively decide which investors will get their time. Our investor segmentation makes it clear that CEOs and CFOs should focus their time on a small set of intrinsic investors, and delegate interactions with trading investors and closet indexers to their investor relations executives. In fact, one of the key roles of the investor relations department should be to determine analytically which investors CEOs and CFOs should develop relationships with, facilitate those relationships, and be the gatekeeper who handles low-priority investors on behalf of the CEO or CFO. The gatekeeper role may not be popular with investors, but it's essential.

Of course, CEOs and CFOs can't ignore the sell-side analysts, whose role has changed over time. Their job is to support their clients, and their most important clients are those who generate the most trading commissions—the trading-oriented investors. Many sophisticated trading (and intrinsic) investors are less concerned about whether the analyst has issued a buy or a hold on a stock (sell recommendations are almost nonexistent), preferring up-to-date news about the company. Hence, sell-side analysts tend to focus on short-term events and near-term earnings so they can be first to pass that news to their clients.

This said, there are often one to three sell-side analysts with deep understanding of the industry dynamics and the company's strategies, opportunities, and risks. These sell-side analysts resemble intrinsic investors in their approach. The logical way to treat sell-side analysts is to segment them into those whose interests and approach tend to mimic trading investors and those whose approach mimics intrinsic investors, and then to pay more attention to the latter segment.

COMMUNICATING WITH INTRINSIC INVESTORS

Intrinsic investors are sophisticated, and they've spent considerable effort to understand your business. They want transparency about results, management's candid assessment of the company's performance, and insightful guidance about the company's targets and strategies. Their role in determining stock prices makes it worth management's while to meet their needs for sophisticated communication that isn't oversimplified.

But many companies are reluctant to provide a detailed discussion of results, issues, and opportunities. Their rationale is that this kind of disclosure reduces their flexibility to manage reported profits or that it will reveal sensitive information to competitors. In our experience, however, a company's competitors, customers, and suppliers already know more about any business than its managers might expect. For example, there's a cottage industry of photographers dedicated to searching for and publicizing new car models that automotive manufacturers have not yet formally acknowledged. In addition, a company's competitors will be talking regularly to the company's customers and suppliers, who won't hesitate to share information about the company whenever that's in their interest. So revealing details about yourself is unlikely to affect your company as adversely as you might expect, and you should

EXHIBIT 30.4 **Whole Foods: ROIC by Age of Store**

Comparable stores	Comps, %	ROIC,[1] %	Number of stores	Average size, square feet	Total square feet
Over 15 years old	4.3	120	86	28,000	2,416,000
Between 11 and 15 years old	4.8	91	68	33,000	2,274,000
Between 8 and 11 years old	4.0	89	49	41,000	2,003,000
Between 5 and 8 years old	7.1	46	54	53,000	2,868,000
Between 2 and 5 years old	6.7	24	48	46,000	2,192,000
Less than 2 years old (including 5 relocations)	18.7	11	30	37,000	1,096,000
All comparable stores	5.9	56	335	38,000	12,849,000
All stores		49	362	38,000	13,779,000

[1] Defined as annualized store-level income after taxes divided by average invested capital; does not reflect any as-if effect of capitalized operating leases.
Source: Whole Foods press release, November 6, 2013.

assess the competitive costs and benefits of greater transparency with that in mind.

In some situations, companies might even be able to gain an advantage over their competitors by being more transparent. Suppose a company has developed a new technology, product, or manufacturing process that management feels sure will give the company a lead over competitors. Furthermore, managers believe competitors will be unable to copy the innovation. At a strategic level, disclosing the innovation might discourage competitors from even trying to compete, if they believe the company has too great a lead. From an investor's perspective, disclosure of the innovation could increase the company's share price relative to its competitors, thus making it more attractive to potential partners and key employees, and reducing the price of stock-based acquisitions.

Sophisticated investors build up their view of a company's overall value by summing the values of its discrete businesses. So they're not much concerned with aggregate results: these are simply averages, providing little insight into how the company's individual businesses might be positioned for future growth and returns on invested capital. At many companies, management teams that desire a closer match between their company's market value and their own assessment might achieve this by disclosing more about the performances of their individual businesses.

Ideally, companies should provide an income statement for each business unit, down to the level of EBITA at least. They should also provide all operating items in the balance sheet—such as property, plant, and equipment (PP&E) and working capital—reconciled with the consolidated reported numbers. Even companies with a single line of business can improve their disclosures without giving away strategically sensitive information. Whole Foods Market, a U.S. natural foods supermarket chain, provides ROIC by age of store, as in Exhibit 30.4. This gives investors deeper insights into the company's economic life cycle.

EXHIBIT 30.5 **Lowe's: Customer Transactions and Average Ticket Size**

Other metrics	**2013**	**2012**	**2011**
Comparable sales increase, %	4.8	1.4	–
Customer transactions, millions	828	804	810
Average ticket, $	64.52	62.82	62.00
At end of year			
Number of stores	1,832	1,754	1,745
Sales floor square feet, millions	200	197	197
Average store size, selling square feet, thousands	109	113	113
Return on average assets, %	6.8	5.7	5.4
Return on average shareholders' equity, %	17.7	13.1	10.7
Return on invested capital, %	11.5	9.3	8.7

Source: Company SEC filings.

Concerning operational data, what to disclose depends on the key value drivers of a business or business unit. Ideally, these should be the metrics that management uses to make strategic or operational decisions. For example, each quarter, the information technology research firm Gartner Group discloses a narrow but highly relevant set of metrics for each of its three business units. As Gartner's CFO explains, the firm publishes only the most important of the metrics that management uses to examine the performance of the business. Companies in some industries, such as steel and airlines, likewise regularly disclose volumes and average prices, as well as the use and cost of energy, which are the key drivers of value in these sectors. Home improvement retailer Lowe's provides helpful information about key value drivers such as the number of transactions and the average ticket size, as shown in Exhibit 30.5.

To make sound investment decisions, intrinsic investors require executives to be honest in their public assessments of their company and its businesses. Yet executives typically approach public announcements less candidly. Most management presentations and publications offer only a celebration of the past year's performance and a less-than-comprehensive assessment of shortfalls. Very few discuss the impact of strategic trade-offs on the numbers—for instance, how a pricing initiative drove growth at the expense of margins. Companies that openly discuss what happened during the year, and that disclose where management has identified pockets of underperformance even in good times, will help investors assess the quality of the executive team and thus the potential for future value creation.

More important, when strategic decisions go bad, investors want to understand what management has learned. Intrinsic investors in particular understand that business requires taking risks and that not all of them pay off. Such investors value forthrightness and will probably support a company through a course correction if they were given enough information previously to develop faith in management's judgment. Says one portfolio manager: "I don't want inside information. But I do want management to look me in the eye when they talk about their performance. If they avoid a discussion or explanation, we will not invest, no matter how attractive the numbers look."

Becoming more transparent can be difficult. Some companies that have preferred greater discretion are not sure whether to increase transparency. These are often strongly performing companies with good track records. Over many years, that performance record (frequently a series of steady earnings increases) has permitted them to rebuff investors' demands for more transparency. But it's the nature of every business's life cycle to see growth slowing after years of success as the business matures or markets become more competitive. At that juncture, the company needs new strategies to keep creating value for shareholders, and these changes should be communicated to investors; doing so ensures that the market share price continues to reflect the company's true worth.

In one situation, a large company didn't disclose that most of its profits came from aging, low-growth products with a large installed base, while its newer high-growth products were far less profitable due to competition and new technologies. In another case, a consumer products company kept its earnings growing by selectively reducing investments in advertising and promotion. Because both companies had long histories of success, any sudden disclosure of these changes would surely cause stock prices to decline sharply, as academic research suggests that when companies in these circumstances fall, they fall hard.[6]

Executives at such companies need to decide whether their current predicament will be short-lived or the days of strong growth and high returns are, in fact, over for the company. If the latter, the executives clearly need a quick transition plan. If the former, they need to assess whether they should practice greater transparency and accept the likely price volatility it will cause until they've returned to their growth path.

Legislation and accounting rules have been requiring ever-greater transparency. Even so, results that are transparent enough to meet today's regulatory requirements may fail to meet the standard of transparency that satisfies intrinsic investors. Companies within an industry typically start to disclose information more useful to such investors in response to the investors' explicit demands or the leadership of one or more industry pioneers. For example, the petroleum industry has for many years published detailed fact books that describe oil production and reserves by geography—key parameters that investors want to know when valuing petroleum companies. In pharmaceuticals, companies provide detailed information about their

[6]D. J. Skinner and R. G. Sloan, "Earnings Surprises, Growth Expectations, and Stock Returns, or Don't Let an Earnings Torpedo Sink Your Portfolio," *Review of Accounting Studies* 7 (2002): 289–312. See also J. N. Myers, L. A. Myers, and D. J. Skinner, "Earnings Momentum and Earnings Management" (working paper, August 2006), available at http://ssrn.com/abstract=741244.

product pipelines at every stage of research and development. In these industries, any company that failed to disclose what others disclose would likely lose the market's trust.

In most industries, however, the level of disclosure and transparency has been less standardized, so management must choose how transparent it wants to be. In these cases, managers are too often cowed by fears that a detailed discussion of the issues and opportunities facing their company will reveal sensitive information to competitors or make it harder to put the best gloss on their results. One large global electronics company, for example, reports gross margins for both its product and services businesses. But nowhere does it provide operating margins for the different units—information that is crucial to helping investors value businesses with differing levels of expenditure on R&D and selling, general, and administrative costs. In another case, a U.S. media conglomerate provides detailed information by business unit on the income statement but leaves it to investors to sort out the balance sheet by business unit. Failing to report such information often gives investors the impression that management is trying to obscure some underlying performance issues.

LISTENING TO INVESTORS

The final element of effective investor communications is listening to investors. Listening to gain competitive intelligence is, of course, a no-lose proposition. But to what extent should executives be influenced by investors' opinions about what strategies the company should pursue (expressed either as opinions or by the nature of the questions the investors ask), particularly when those opinions run counter to what the senior executives believe is the best strategy for creating long-term value?

The answer lies again in the segmentation of the investors and the interpretation of investor input in light of the investors' own strategies. For example, trading investors (who tend to be the most vocal and frequent voices) base their trading strategies on *events*. So they prefer frequent announcements and short-term actions to create trading opportunities. Intrinsic investors, in contrast, are more concerned with longer-term strategic initiatives and the broader forces driving the company and industry. Segmenting investor input helps executives sort through the competing views. We typically find that when executives segment the input they receive from investors, the input from the intrinsic investors is most helpful.

In the end, though, executives have more information than investors about their company, its capabilities, opportunities, and threats. They need to be confident about their strategic choices and convey that confidence to investors. You can't expect to please all investors. You must do what's right for long-term value creation.

EARNINGS GUIDANCE

Many executives view the ritual of issuing guidance on their likely earnings per share (EPS) in the next quarter or year as a necessary, if sometimes onerous, part of communicating with financial markets. In a survey, we found that they saw three primary benefits of issuing earnings guidance: higher valuations, lower share price volatility, and improved liquidity. Yet our analysis found no evidence that those expected benefits materialize. Therefore, instead of EPS guidance, we believe executives should provide investors with the broader operational measures shaping company performance, such as volume targets, revenue targets, and initiatives to reduce costs.[7]

In 2002, Coca-Cola became one of the earliest large companies to stop issuing guidance. Its executives had concluded that providing short-term guidance prevented management from concentrating on strategic initiatives to build its businesses over the long term. Gary Fayard, CFO at that time, believed that, rather than indicating weak earnings, the move signaled a renewed focus on long-term goals. The market seemed to agree and did not react negatively: Coke's share price held steady.[8] Since then, many other companies have stopped providing guidance entirely or have shifted the focus of their guidance away from EPS and toward broader indicators of performance.

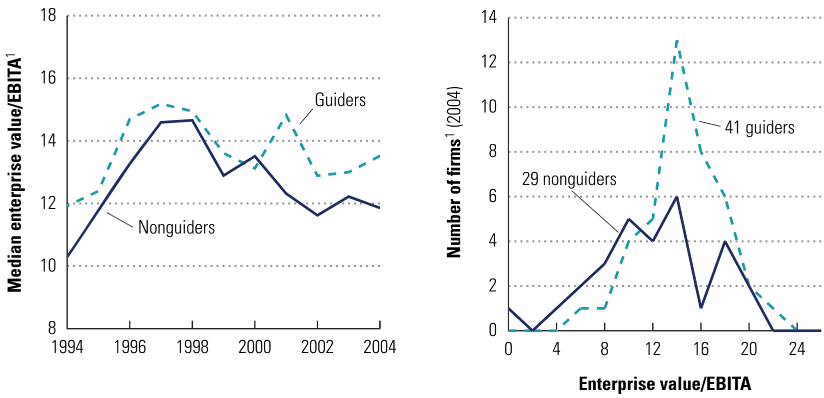
To test whether companies providing EPS guidance are rewarded with higher valuations, we compared the earnings multiples of companies that provided guidance with those that did not, industry by industry. For most industries, the underlying distributions of the two sets of companies were statistically indistinguishable. Exhibit 30.6 shows this pattern for the consumer packaged-goods industry. The left side shows the median multiple of enterprise value to EBITA for companies providing guidance and those that didn't each year from 1994 to 2004. The right side shows the distribution of multiples for the companies in each group. Although the median for those who provide guidance is slightly higher, the graph on the right side shows that the distributions of multiples are similar.

Companies that decide to begin offering guidance may hope the effort will boost total returns to shareholders (TRS). Yet in the year companies begin to offer guidance, their TRS on average is no different from TRS at companies that don't offer guidance at all (Exhibit 30.7). Returns to shareholders are just as likely to be above the market as below the market in the year a company starts providing guidance.

On the issue of share price volatility, we found that when a company begins to issue earnings guidance, the likelihood of volatility in its share price increasing or decreasing is just the same as it is for companies that don't issue

[7]P. Hsieh, T. Koller, and S. Rajan, "The Misguided Practice of Earnings Guidance," *McKinsey on Finance* (Spring 2006): 1–5.
[8]D. M. Katz, "Nothing But the Real Thing," *CFO*, March 2003, http://cfo.com.

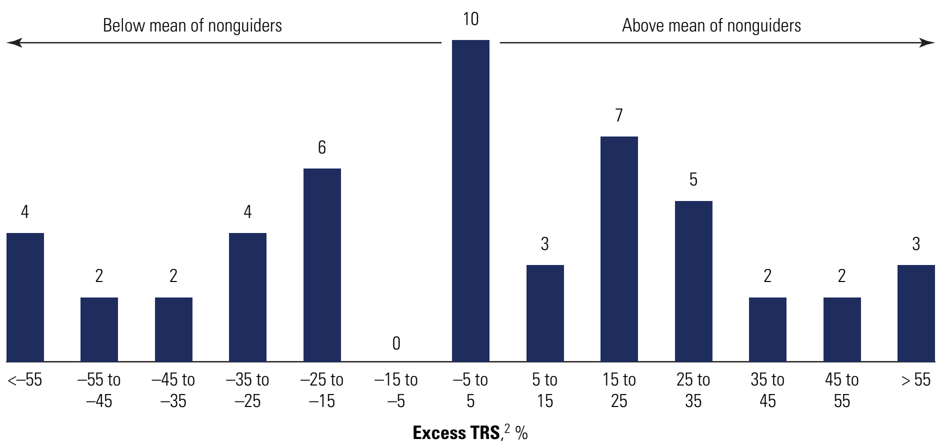
EXHIBIT 30.6 **Consumer Packaged Goods: Similar Multiples for Guiders and Nonguiders**



[1] Among companies in packaged foods and meats, personal products, household products, soft drinks, and brewers.
Source: Thomson First Call.

EXHIBIT 30.7 **Minimal Impact of Guidance on TRS**

Number of first-year guider firms with returns at given level relative to industry[1]



[1] 50 firms in guiding sample, all from the consumer packaged-goods sector.
[2] Excess TRS for a firm is defined as TRS in year of starting guidance minus median TRS in same year for nonguiding firms. At the 99% confidence level, the mean of the underlying distribution is not different from zero. Results are similar for the year after starting guidance.
Source: Thomson First Call.

guidance. Finally, we found that when companies begin issuing earnings guidance, they do indeed experience an increase in trading volumes relative to companies that don't provide it, as their management anticipates. However, the effect wears off the next year.

When we asked executives about ceasing earnings guidance, many feared that their share price would decline and its volatility would increase. But when we analyzed 126 companies that had discontinued issuing guidance, we found they were just about as likely as the rest of the market to see higher or lower shareholder returns. Of the 126 companies, 58 had higher returns than the overall market in the year they stopped issuing guidance, and 68 had lower returns. Furthermore, our analysis showed that the lower-than-market returns of companies that discontinued guidance resulted from poor underlying performance, not from the act of ending guidance. For example, two-thirds of the companies that halted guidance and experienced lower returns on capital saw lower TRS than the market. For companies that increased ROIC, only about one-third had delivered lower TRS than the market.

Our conclusion was that issuing guidance offers companies and investors no real benefits. On the contrary, it can trigger real costs and unfortunate unintended consequences. The difficulty of predicting earnings accurately, for example, frequently causes management teams to endure the painful experience of missing quarterly forecasts. That, in turn, can be a powerful incentive for management to focus excessive attention on the short term, at the expense of longer-term investments, and to manage earnings inappropriately from quarter to quarter to create the illusion of stability. Moreover, our research with intrinsic investors indicates that they realize that earnings are inherently unpredictable. For that reason, they prefer that companies not issue quarterly EPS guidance.

As an alternative, we believe executives will gain advantages from providing guidance on the real short-, medium-, and long-term value drivers of their businesses, providing ranges rather than point estimates. For example, some companies provide target ranges for returns on capital. Other companies provide a range of possibilities for revenue growth under a variety of assumptions about inflation, and they discuss the growth of individual business units when that matters. Some companies also provide information on value drivers that can help investors assess the sustainability of growth. Humana, for example, provides guidance on estimated membership in its health plans—including plans whose membership the company expects will decline. Gartner sets out a range of long-term goals, such as growth targets by business unit, margin improvement targets, and capital spending goals.

The value drivers a business chooses to publicize will depend on the unique characteristics of the business. For example, a leading project-based company provides details on the performance of individual current projects, plus the timing and expected returns of potential projects. One European company provides investors with a tax estimation tool, which uses the investors' assessments of regional growth rates to provide a best guess on the tax rates the company will face.

Ideally, a company would provide the kind of information that would help investors make their own projections of the company's performance based on their assessment of external factors. For example, in resource industries, prices are volatile for extracted commodities such as gold, copper, or oil. For such companies, a management team's view on future prices is not necessarily better than that of their investors. Investors would therefore find production targets more useful than revenue targets in these industries. Similarly, exchange rates are unpredictable, yet they can affect the profits of multinationals by 5 percent or more in a given year. Companies should therefore avoid predicting exchange rates and locking them into EPS targets. Rather, they should discuss their targets at constant currency rates. This would give investors a much clearer picture of expected performance.

MEETING CONSENSUS EARNINGS FORECASTS

Whether or not a company provides guidance, there will be an analyst consensus earnings forecast to meet or beat.[9] The conventional wisdom, mistaken though it is, is that missing the consensus earnings forecast, even by a small amount, means that your share price will drop. A striking example: in early 2005, when eBay reported that it had missed the fourth-quarter 2004 consensus estimate by just one penny, its share price plunged 22 percent. Conversely, many executives believe that consistently beating the consensus leads to a premium share price. Thus, a common reason for choosing to provide earnings guidance is to influence the consensus.

Besides trying to influence the consensus, executives often go to some lengths to meet or beat consensus estimates—even acting in ways that could damage the longer-term health of the business. It's not uncommon, for example, for companies to offer customers steep discounts in the final days of a reporting period in order to stoke sales numbers, in effect borrowing from the next quarter's sales. As other researchers have shown, executives may forgo value-creating investments in favor of short-term results,[10] or they might manage earnings inappropriately to create the illusion of stability.

Yet our analysis of large U.S. companies shows that these fears are unfounded.[11] In the near term, falling short of consensus earnings estimates is seldom catastrophic. Even consistently beating or meeting consensus estimates over several years does not matter, once differences in companies' growth and operating performance are taken into account. In fact, a company's performance relative to consensus earnings seems to matter only when the company consistently misses earnings estimates over several years.

[9] The section is adapted from T. Koller, R. Raj, and A. Saxena, "Avoiding the Consensus Earnings Trap," *McKinsey on Finance*, no. 45 (Winter 2013).
[10] J. R. Graham, C. Harvey, and S. Rajgopal, "Value Destruction and Financial Reporting Decisions," *Financial Analysts Journal* 62 (2006): 27–39, which found that a majority of CFOs would "avoid initiating a positive NPV project if it meant falling short of the current quarter's consensus earnings."
[11] This conclusion is based on analysis of the largest U.S.-based nonfinancial companies with a December 31 fiscal year-end, a sample of 266 companies.

This doesn't mean that companies should ignore consensus estimates, which can hint at what is on investors' minds and why. For example, how does the industry growth outlook of investors compare with that of executives? The consensus can also be used to assess how well analysts and investors understand the drivers of a company's performance. Our findings demonstrate that when investors are valuing a company, they consider more indicators of financial health than just whether the company meets its consensus earnings estimates. Thus, companies need not go to extremes to meet or beat analysts' expectations if it means damaging the long-term prospects of the company.

Most executives haven't personally experienced many catastrophic drops in share price after minor earnings misses, so they conclude that such misses are rare. The mechanics of earnings estimates lend some support to that perception. After all, analysts' estimates are typically overly optimistic at the beginning of the financial year, but by the third quarter, it's reasonable to expect them to fall roughly in line with the eventual reported earnings—a pattern borne out by previous research.[12] According to standard practice, a company has beaten the consensus estimate if its actual earnings are greater than the last available estimate for the year (almost always projected after the year is over). Consequently, one would expect analyst estimates at that stage to be accurate. Moreover, executives tend to focus on dramatic press accounts of earnings mishaps that are among the most extreme outliers, as in the eBay example where missing the consensus forecast led to a sharp drop in share prices.

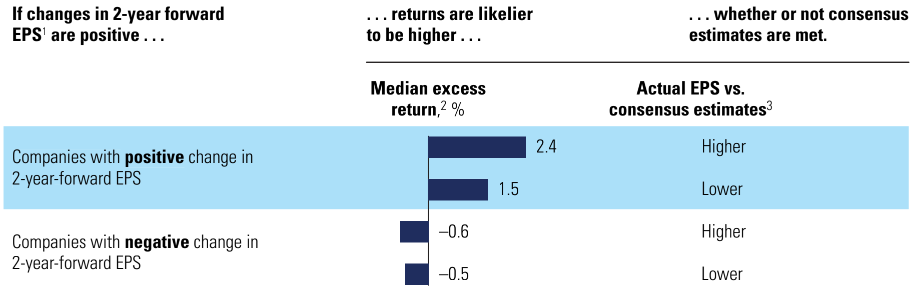
In fact, falling short is common, and the effect is benign. More than 40 percent of companies generate earnings below consensus estimates—whether those estimates are compiled an entire year or just three days before an earnings announcement. Although some academics have documented a correlation between the change in a company's share price before and after the announcement of earnings and the degree to which it meets the consensus earnings estimate, the size of the effect is small. Indeed, our analysis suggests that missing the consensus by 1 percent would lead to a share price decrease of only 0.2 percent in the five days after the announcement. In other words, missing the consensus estimate by a penny or so usually just doesn't matter (despite the unusual case of eBay).

Executives concerned about their company's performance relative to consensus estimates should also consider that 40 percent of companies saw their share price, adjusted for the market, move in the opposite direction of their earnings miss. For example, when PPG Industries, a global supplier of paints, coatings, and chemicals, announced earnings for 2010 that were 4 percent below the consensus, the market reacted positively with an excess return of 7 percent. Why? On digging deeper, investors saw that the long-term outlook

[12] M. Goedhart, B. Russell, and Z. Williams, "Prophets and Profits," *McKinsey Quarterly* (October 2001).

EXHIBIT 30.8 **Impact of EPS vs. Earnings Surprise**

Analysis of 590 announcements of fiscal-year earnings for 2007 by European companies



[1] Earnings per share.
[2] Excess return over market return.
[3] Sample size: posititve and lower = 127, positive and higher = 203, negative and lower = 118, negative and higher = 142.

had improved. Sales were stronger than expected in nearly all business segments. The CEO also announced some investment initiatives that investors viewed as having the potential to create value in the longer term.

Conversely, when North American brewing company Molson Coors beat the consensus estimate by 2 percent in 2010, the market nevertheless reacted negatively, with an excess return of –7 percent. Investors saw that the company's sales volume had declined by 2 percent and that margins also were down; the company beat the consensus only because of a lower-than-expected tax rate. The market reacted to the fundamental drivers of performance—volume and margin—rather than EPS itself.

As the Molson Coors example demonstrates, meeting or missing the consensus estimate is less important than how the earnings were reached. That's because investors are continually assessing other news, such as whether the company met the consensus estimate for revenues as well as earnings.

Investors are also able to see through cases where one-off items are responsible for meeting the consensus estimate. Meanwhile, earnings announcements themselves often include information that helps investors reassess a company's long-term performance outlook. Our research has shown that the market reaction at the time of an earnings announcement is influenced more by changes in analysts' expectations for longer-term earnings than by whether the most recent results met the consensus estimate. A company might fall short of current-year earnings estimates and still see its share price increase if analysts revised their earnings estimates upward for the next two years (see Exhibit 30.8).

Just as critical, the notion that markets reward companies with higher share prices when they consistently beat the earnings consensus turns out to be wrong. Here again, while some researchers have found this to be true, their

EXHIBIT 30.9 **Fundamentals vs. Consensus Estimates**

Median excess return vs. sector return,[1] 2005–2011, %

	High growth + high ROIC[2]	High growth + low ROIC[2]	Low growth + high ROIC[2]	Low growth + low ROIC[2]
Consistently beating[3]	4	3	0	–2
Inconsistent[3]	2	0	0	–3
Consistently missing[3]	0	–5	–5	–6

[1] Company's total returns to shareholders (TRS) minus median TRS of the sector. Sample size is 243 nonfinancial S&P 500 companies with December fiscal year-end.
[2] ROIC = return on invested capital (2005–2011); growth = compound annual growth rate of revenue (2004–2011). Companies categorized as high ROIC or high growth exceeded the absolute reference points of 15% for ROIC and 7% for growth or the median of the respective sector in the sample.
[3] Difference between actual earnings per share and consensus estimate 30 days prior to earnings announcement. "Consistently beating" defined as beating expectations by >2% at least 4 out of 7 years, 2005–2011. "Consistently missing" defined as missing expectations by >2% at least 4 out of 7 years. Companies consistently meeting expectations (by +/– 2% at least 4 out of 7 years) are not shown due to small sample size.

Source: Standard & Poor's Capital IQ.

analysis doesn't take into consideration the underlying performance of companies as measured by revenue growth and return on capital.[13] Once adjusted for performance, the apparent effect of consistently beating the consensus, which we define as four or more years out of seven, disappears. Companies with strong growth or ROIC had high shareholder returns regardless of whether they consistently beat the consensus. Only those companies that consistently missed it—again, in four years out of seven—showed a statistically significant negative effect from doing so (see Exhibit 30.9).

SUMMARY

The issues surrounding investor communications will remain unresolved for some time. Traditionally, there have been two camps: those who believe you can talk up your share price and those who believe companies shouldn't spend much time or effort on investor communications at all, because it won't make any difference to their market value. Our view is that investors can more accurately value a company if they have the right information, and that a market

[13] For example, R. Kasznik and M. McNichols, "Does Meeting Earnings Expectations Matter? Evidence from Analyst Forecast Revisions and Share Prices," *Journal of Accounting Research* 40, no. 3 (June 2002): 727–759.

value aligned with the true value of your company is the best outcome of your investor communications strategy. Moreover, even if you do manage to talk up the stock in the short term, this is unlikely to be the best thing for the company in the long run.

You can better align your company's stock market value with its intrinsic value by applying some of the systematic approaches described in this chapter for understanding your value, understanding your current and potential investors, and communicating with the sophisticated investors who ultimately drive a company's share price. These principles also can help managers use their scarce time for investor communications more efficiently and effectively.

Moreover, rather than providing precise earnings guidance or taking actions to achieve consensus earnings forecasts, managers should focus on driving return on invested capital (ROIC) and growth to create maximum value for shareholders. Managers should not be distracted from their efforts to drive ROIC and growth by any short-term price volatility—that is, any temporary deviation in their share price from its intrinsic value—because such deviations are likely to occur from time to time, even in the most efficient stock market.

Part Five

Special Situations

31

Emerging Markets*

Over the past decade, emerging economies in Asia, South America, Eastern Europe, and Africa grew impressively. Many of them even recovered earlier and faster than developed economies after the 2008 recession. Brazil, Russia, India, and China all moved into the top 10 of the world's largest economies in 2014 as measured by gross domestic product (GDP).[1] As these economies become more important to the global economy and to investors, it is necessary to ensure that we have sound ways to analyze and value companies and business units in these markets.

Chapters 22 and 23 discussed general issues related to forecasting cash flows in a foreign currency, estimating cost of capital in a foreign currency, and incorporating high inflation rates into cash flow projections. This chapter focuses on the additional issues that arise in emerging markets. These include macroeconomic uncertainty, illiquid capital markets, controls on the flow of capital into and out of the country, less rigorous standards of accounting and disclosure, and high levels of political risk. It is impossible to generalize about these risks, as they differ by country and may affect businesses in different ways. Academics, investment bankers, and industry practitioners subscribe to different methods and often make arbitrary adjustments based on intuition and limited empirical evidence.

We recommend a triangulation approach—comparing estimates of value derived from three different methods. First, we use discounted cash flows (DCFs) with probability-weighted scenarios that model the risks the business faces. Then we compare the value obtained from this approach with the results of two secondary approaches: a DCF valuation with a country risk premium built into the cost of capital, and a valuation based on comparable trading and transaction multiples. We illustrate the approach with the valuation of

*The authors would like to thank André Annema for his contribution to this chapter.

[1]World Bank, World Development Indicators database, July 1, 2014. GDP measured in U.S. dollars.

ConsuCo, a Brazilian retail company focusing on both food and durable consumer goods.[2]

The basics of estimating a DCF value are the same in emerging markets as elsewhere, so we follow the same steps in the valuation process as in Part Two: conducting a historical analysis, forecasting cash flows, estimating the cost of capital, and calculating and interpreting results. We also address an important additional step required for an emerging-market valuation: incorporating country risk into the valuation, using the scenario DCF approach.

HISTORICAL ANALYSIS

Accounting conventions in emerging markets may differ substantially from those of developed markets, making it difficult to understand a company's economics. Furthermore, in many countries, complicated tax credits and adjustments make cash taxes harder to estimate than in developed markets. However, large accounting and tax differences are frequently eliminated when the income statement and the balance sheet are brought together in the cash flow calculation, following the guidelines set out in Chapter 9. Nevertheless, you need to understand the possible differences before starting any valuation of an emerging-market company.

In the case of our analysis of ConsuCo in 2008, there were no major accounting differences to adjust for. Brazilian Generally Accepted Accounting Principles (GAAP) changed at the end of 2006 and had become very similar to U.S. GAAP and International Financial Reporting Standards (IFRS) regarding, for instance, accounting for leases, derivatives, and stock-based compensation. As an illustration, consider that before this change, ConsuCo treated all leases as off-balance-sheet operating leases. By 2008, it was applying the same standards as under U.S. GAAP for classifying leases as either operating or financial, including additional disclosure requirements. Although most leases remained operating leases, this did not affect our assessment, because we made a standard capital adjustment for operating leases, following the approach described in Chapter 20. One area where a difference remained was goodwill, which was amortized under Brazilian GAAP. In addition, any goodwill was measured relative to the book value of the relevant assets and liabilities, whereas U.S. GAAP typically uses their fair value. Again, our assessment for valuation was not affected, because we added back any goodwill amortization on a cumulative basis to calculate invested capital.

Having found no major accounting differences to manage, we analyzed ConsuCo's historical financial statements following the approach described in Chapter 10. We rearranged the balance sheet and the income statement to obtain statements for net operating profit less adjusted taxes (NOPLAT),

[2]This case illustration is a disguised example.

invested capital, and free cash flow. We then estimated some key financial ratios on an approximate real-terms basis. Although annual inflation in Brazil was moderate between 1997 and 2008 at an average level of 7 percent, ratios such as operating margin and capital turnover are likely to be biased by inflation when directly calculated from the financial statements. To offset this bias, we looked at trends in cash operating margins—that is, earnings before interest, taxes, depreciation, and amortization (EBITDA) divided by sales. In addition, we estimated sales in real terms per store and per square meter of store space over time, to understand the development of real-terms capital turnover.

The results are reflected in Exhibit 31.1. Between 2004 and 2008, ConsuCo's sales growth in real terms was highly volatile, with a compound annual growth rate of 3.4 percent, similar to the growth in the number of stores and very close to real GDP growth. This was largely driven by strong growth in 2008, which was mostly due to improved average store performance. Still, average growth since 2003 was relatively low compared with the preceding five years: the average real growth over the past 10 years was about 6 percent per year. The average level of sales per store in real terms was quite stable, but this does not reflect the increasing store size. With average sales per square meter decreasing and store size increasing, profit margins and return on invested capital (ROIC) deteriorated: the EBITDA/sales margin decreased to around 7 percent, and ROIC was about 6 percent in 2008.

Performance in 2008 suggested that recently launched initiatives to improve efficiency and productivity had started to pay off. Yet a key question was how much additional potential remained, and consequently what levels of long-term growth and ROIC should be incorporated into ConsuCo's financial forecasts.

FORECASTING CASH FLOWS

Every forecast of a company's financial performance is based on assumptions about real GDP growth, inflation rates, interest and exchange rates, and whatever other parameters, such as energy prices, are deemed relevant. In emerging markets, these parameters can fluctuate wildly from year to year. It becomes all the more important that forecasts be based on an integrated set of economic and monetary assumptions of future inflation, interest rates, exchange rates, and cost of capital (see Chapter 23 for more details). For instance, make sure that the same inflation rates underlie the financial projections and cost of capital estimates for the company.

Exchange rates are one parameter that deserves special attention. Although exchange rates converge to purchasing power parity (PPP) in the long run,[3]

[3]For an overview, see A. M. Taylor and M. P. Taylor, "The Purchasing Power Parity Debate," *Journal of Economic Perspectives* 18, no. 4 (Fall 2004): 135–158.

EXHIBIT 31.1 **ConsuCo: Key Historical Financial Indicators**

reais, million

	2004	2005	2006	2007	2008
Invested capital					
Current operating assets	4,769	4,833	5,194	5,936	6,133
Current operating liabilities	(2,650)	(2,953)	(3,596)	(4,051)	(4,304)
Net operating working capital	2,119	1,880	1,598	1,885	1,829
Net property, plant, and equipment	6,322	5,517	6,059	6,886	7,059
Other net operating assets	3,427	3,683	5,006	5,258	5,756
Operating invested capital (excluding goodwill)	11,868	11,080	12,662	14,028	14,645
Goodwill plus cumulative goodwill written off	2,067	2,104	1,940	2,221	2,319
Operating invested capital (including goodwill)	13,935	13,184	14,602	16,249	16,964
Excess marketable securities	1,326	2,061	1,434	1,094	1,807
Other nonoperating assets	818	652	449	451	518
Total investor funds	16,079	15,897	16,485	17,795	19,289
Total interest-bearing debt and operating leases	8,299	7,662	8,127	8,965	9,664
Other nonoperating liabilities	1,318	1,538	1,728	1,737	1,774
Adjusted equity	6,462	6,697	6,630	7,093	7,851
Total investor funds	16,079	15,897	16,485	17,795	19,289
NOPLAT					
Sales	17,950	19,162	19,829	21,290	25,762
Cost of goods sold	(12,702)	(13,483)	(14,233)	(15,321)	(18,971)
Other operating costs	(3,864)	(4,119)	(4,349)	(4,523)	(4,933)
EBITDA	1,384	1,560	1,247	1,447	1,858
Depreciation and amortization	(498)	(631)	(442)	(447)	(588)
Adjusted EBITA	886	929	805	1,000	1,269
Cash taxes	(43)	(207)	(324)	(179)	(329)
NOPLAT	844	722	481	821	940
Key financial ratios					
Nominal indicators, %					
Sales growth	16.3	6.8	3.5	7.4	21.0
Adjusted EBITA/sales	4.9	4.8	4.1	4.7	4.9
NOPLAT/sales	4.7	3.8	2.4	3.9	3.6
Invested capital (excluding goodwill)/sales	58	64	66	57	54
Invested capital (including goodwill)/sales	69	74	76	66	62
ROIC (excluding goodwill)	7.1	6.5	3.8	5.9	6.4
ROIC (including goodwill)	6.1	5.5	3.3	5.1	5.5
Approximate real indicators, %					
Sales growth (inflation-adjusted)	1.4	0.1	–3.1	3.0	16.8
Gross profit/sales	29.2	29.6	28.2	28.0	26.4
EBITDA/sales	7.7	8.1	6.3	6.8	7.2
Sales/store (reais million)	32.7	32.5	31.9	31.3	35.2
Sales/square meter (reais thousand)	15.8	15.0	14.4	13.5	15.5

EXHIBIT 31.2 **Economic and Monetary Assumptions**

%

	2006	2007	2008	2009E	2010E	...	2014E
Real GDP growth							
Brazil	4.0	5.7	5.1	–0.7	3.5	...	3.7
United States	2.7	2.1	0.4	–2.7	1.5	...	2.1
Inflation (consumer prices)							
Brazil	4.2	3.6	5.7	4.8	4.1	...	4.5
United States	3.2	2.9	3.8	–0.4	1.7	...	2.2

Source: International Monetary Fund *World Economic Outlook.*

short-term deviations can be sizable and last for several years—especially in the case of emerging markets. In Chapter 23, Exhibit 23.5 shows how even on an inflation-adjusted basis, the exchange rate of Brazil's currency, the real (plural: reais), has fluctuated strongly over the past 50 years versus the U.S. dollar. If the long-term average real exchange rate is indicative of PPP,[4] the Brazilian currency could have been overvalued versus the U.S. dollar and other currencies by as much as 20 to 35 percent in 2008. Any exchange rate convergence to PPP would not be likely to affect the cash flows and value generated by a retailer such as ConsuCo, as its revenues and costs are mainly determined in Brazilian reais. But an exchange rate change would affect its cash flow and value measured in foreign currency. Because predicting exchange rates is virtually impossible,[5] a range estimate of the impact on a company's value measured in foreign currency is more meaningful. For ConsuCo, it would therefore be best to perform the DCF valuation in Brazilian reais and—if needed—translate the result at both the actual and the PPP exchange rates to obtain a value range in foreign currency.

Exhibit 31.2 shows other key economic and monetary assumptions that were used for ConsuCo's valuation, focusing on real GDP growth and inflation. Due to the global economic crisis that began in 2008, real GDP growth was expected to slow down in the short term before settling at an annual rate of between 3 and 4 percent after 2010. In line with growth forecasts, near-term inflation was expected to ease somewhat and return to about 4.5 percent in 2014, beyond which we assumed it to be constant.

Based on historical analysis and information from analyst reports up to September 2009, we made the operating and financial forecasts summarized in Exhibit 31.3 in real and nominal terms. We assumed that no major economic crisis would materialize in Brazil after 2010.

[4]See Chapter 23 for more details on PPP and exchange rates.

[5]As Exhibit 23.5 also shows, the Brazilian real further strengthened against the U.S. dollar and other currencies in real terms after 2008, before showing some correction in 2013.

EXHIBIT 31.3 **ConsuCo: Summary Financial Projections, Base Case**

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Operating projections										
Sales growth, reais, %	10.0	10.0	9.0	8.0	7.0	6.0	...	3.8	...	3.0
EBITDA/sales, %	7.4	7.6	7.8	7.8	7.8	7.8	...	7.8	...	7.8
Sales/square meter, reais, thousand	16.0	16.7	17.1	17.4	17.6	17.6	...	17.6	...	17.6
Capital expenditures,[1] reais, million	591	671	727	788	853	789	...	1,044	...	1,250
Real projections										
Sales, reais, million	13,885	15,274	16,649	17,981	19,239	20,394	...	25,485	...	29,889
Adjusted EBITA/sales, %	5.9	6.0	6.1	6.0	6.0	5.9	...	5.6	...	5.3
NOPLAT/sales, %	4.3	4.3	4.3	4.1	4.0	3.9	...	3.6	...	3.4
Invested capital/sales,[2] %	56.1	55.8	55.7	55.9	56.3	56.3	...	58.8	...	61.2
ROIC,[2] %	7.6	7.6	7.7	7.4	7.1	6.9	...	6.2	...	5.6
Nominal projections										
Sales, reais, million	14,552	16,663	18,926	21,319	23,815	26,380	...	41,081	...	60,043
Adjusted EBITA/sales, %	6.1	6.2	6.4	6.4	6.4	6.4	...	6.3	...	6.2
NOPLAT/sales, %	4.4	4.5	4.6	4.5	4.4	4.4	...	4.4	...	4.3
Invested capital/sales,[2] %	54.1	52.6	51.4	50.6	50.1	49.2	...	48.2	...	48.2
ROIC,[2] %	8.1	8.5	9.0	9.0	8.9	9.0	...	9.1	...	9.0

[1] Inflation adjusted.
[2] Invested capital excluding goodwill.

Historical analysis showed a turnaround in ConsuCo's performance during 2008, which we believed to be genuine and sustainable. During the preceding few years, management of the company had changed, and current management had a strong track record in delivering turnaround performance. The company had put considerable effort into improving same-store sales growth in food, which first became apparent with 2008's results. In the nonfood segment (items such as furniture and electronics), ConsuCo was also well positioned as a result of competing in various different formats and channels. These categories had low penetration in Brazil and were expected to show double-digit growth over years to come. Finally, through some portfolio changes, the company had entered new regions in Brazil, where it could roll out some of its existing formats.

We therefore assumed that the company could deliver about 10 percent real sales growth in the short term, gradually declining to the longer-term historical average of 6 percent. In the very long term, we expected Brazil's economic growth rate to be in line with average historical real GDP growth rates in the United States. We forecast limited improvement in operating margins. Despite ConsuCo's ongoing gains in efficiency, we expected increasing competition for market share to put downward pressure on margins. We were therefore skeptical that ConsuCo would see further margin improvement in the continuing-value period.

Capacity requirements and expected capital expenditures were derived from real growth forecasts combined with assumed increases in sales productivity. We expected sales productivity to further improve over the next few years, with sales per square meter of store space returning to levels similar to those of about five years earlier. However, to realize sales productivity, ConsuCo would also have to invest in substantially reformatting stores, resulting in an increase in total net property, plant, and equipment (net PP&E) per square meter. As a result, invested capital as a percentage of sales would initially drop in real terms but slowly increase again in the longer term.

Although ROIC in real terms was expected to increase until 2011 as a result of improved sales productivity, we expected it to decline afterward to just under 6 percent in the continuing-value period. In contrast, we forecast that the ROIC in nominal terms would increase from 8 percent to 9 percent because of inflation's impact on capital turnover.

Strong growth in the first four years combined with the reformatting and upgrading of stores meant that free cash flow would be negative in those years because of the significant investments required. If growth in capacity and revenues in 2010 were actually a few percentage points lower, the free cash flow would be positive.

INCORPORATING COUNTRY RISK IN SCENARIO DCF VALUATION

The major distinction between valuing companies in developed markets and emerging ones is the latter's increased level of risk. Not only do you need to account for risks related to the company's strategy, market position, and industry dynamics, as you would in a developed market, but you must also deal with the risks caused by greater volatility in local capital markets and the macroeconomic and political environment.

The preferred option is to model risks explicitly in the cash flow projections in what we call the *scenario DCF approach.* An alternative is to reflect the risk in a so-called *country risk premium* to the discount rate. Both methodologies, if applied correctly and consistently, lead to the same result. We show this in the following example of an investment in two identical production plants, one in Europe and the other in an emerging economy (see Exhibit 31.4). However, the scenario DCF approach is analytically more robust and does a better job of showing the impact of emerging-market risks on value.

Scenario DCF Approach

The scenario DCF approach simulates alternative trajectories for future cash flows. At a minimum, model two scenarios: The first should assume that cash flow develops according to conditions reflecting business as usual (i.e., without major economic distress). The second should reflect cash flows assuming that one or more emerging-market risks materialize.

EXHIBIT 31.4 **Scenario DCF vs. Country Risk Premium DCF**

€

Net present value for identical facilities in . . .

Scenario approach

. . . a European market

Probability	Cash flows in perpetuity[1]	Year 1	2	3	4	. . .
100%	"As usual"	100	103	106	109	
0%	"Distressed"					
	Expected cash flows	100	103	106	109	
	Cost of capital			7.5%		
	Net present value		2,222			

. . . an emerging market

Probability	Cash flows in perpetuity[2]	Year 1	2	3	4	. . .	
75%	"As usual"	100	103	106	109		
25%	"Distressed"	45	46	48	49		
	Expected cash flows	86	89	92	94		
	Cost of capital			7.5%			
	Net present value		1,917				86% of European NPV

Country risk premium approach

. . . a European market

Cash flows in perpetuity[1]	Year 1	2	3	4	. . .
"As usual"	100	103	106	109	
Cost of capital			7.5%		
Net present value		2,222			

. . . an emerging market

Cash flows in perpetuity[2]	Year 1	2	3	4	. . .	
"As usual"	100	103	106	109		
Cost of capital			7.5%			
Country risk premium			0.7%			
Adjusted cost of capital			8.2%			
Net present value		1,917				86% of European NPV

[1] Assuming perpetuity cash flow growth of 3%.
[2] Assuming perpetuity cash flow growth of 3% and recovery under distress of 45% of cash flows "as usual."

In the example, the cash flows for the European plant grow steadily at 3 percent per year into perpetuity. For the plant in the emerging market, the cash flow growth is the same under a business-as-usual scenario, but there is a 25 percent probability of economic distress resulting in a cash flow that is 55 percent lower into perpetuity. The emerging-market risk is taken into account, not in the cost of capital but in the lower expected value of future cash flows from weighting both scenarios by the assumed probabilities. The resulting value of the emerging-market plant (€1,917) is clearly below the value of its European sister plant (€2,222), using a weighted average cost of capital (WACC) of 7.5 percent.

We assumed for simplicity that if adverse economic conditions develop in the emerging market, they will do so in the first year of the plant's operation. In reality, of course, the investment will face a probability of domestic economic distress in each year of its lifetime. Modeling risk over time would require more complex calculations yet would not change the basic results. We also assumed that the emerging-market business would face significantly lower cash flows in a local crisis but not wind up entirely worthless.

Country Risk Premium DCF Approach

The second approach is to add a country risk premium to the cost of capital for comparable investments in developed markets. You then apply the resulting discount rate to the cash flow projections in a business-as-usual scenario. The key drawback is that there is no objective way to establish the country risk premium. For our two-plant example, we can derive in hindsight what the premium should be to obtain the same result as under the scenario DCF approach. For us to arrive at a value of €1,917 for the emerging-market plant, the discount rate for the business-as-usual projections would have to be 8.2 percent, which translates to a country risk premium of 0.7 percent.

On occasion, practitioners make the mistake of adding the country risk premium to the cost of capital to discount the *expected* value of future cash flows, rather than to discount the *promised* cash flows of a business-as-usual scenario. The resulting value is too low because this approach accounts twice for the probability of a crisis.[6]

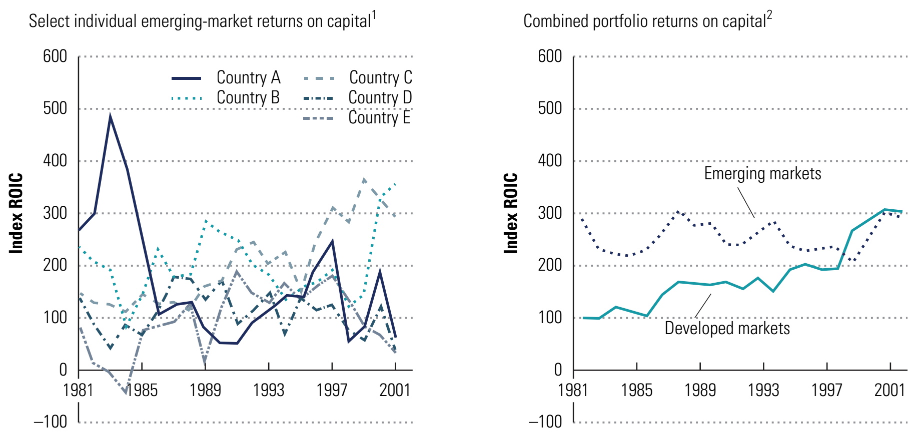
Why Scenario DCF Is Superior to Country Risk Premium DCF

Some surveys show that managers generally adjust for emerging-market risks by adding a risk premium to the discount rate.[7] Nonetheless, for the following

[6]This is analogous to the error made by discounting the expected coupon and principal payments on a corporate bond at the promised yield (i.e., the yield to maturity) instead of the expected yield (i.e., the cost of debt).

[7]T. Keck, E. Levengood, and A. Longfield, "Using Discounted Cash Flow Analysis in an International Setting: A Survey of Issues in Modeling the Cost of Capital," *Journal of Applied Corporate Finance* 11, no. 3 (1998): 82–99.

EXHIBIT 31.5 **Returns on Diverse Emerging-Market Portfolio**



[1] In stable currency and adjusted for local accounting differences.
[2] Combined portfolio included additional countries not reflected here.

Source: Company information.

reasons, we recommend using the scenario DCF valuation as your primary approach, while using the country risk premium and multiples approaches for triangulation.

Country risks are largely diversifiable Most country risks, including expropriation, devaluation, and war, are largely diversifiable (though not entirely, as the economic crises in 1998 and 2008 demonstrated). Consider the international consumer-goods player illustrated in Exhibit 31.5. Its returns on invested capital were highly volatile for individual emerging markets. Taken together, however, these markets were hardly more volatile than developed markets; the corporate portfolio diversified away most of the risks. Finance theory clearly indicates that the cost of capital should not reflect risk that can be diversified. This does not mean that diversifiable risk is irrelevant for a valuation: the possibility of adverse future events will affect the level of expected cash flows, as in the example in Exhibit 31.4. But once this has been incorporated into the forecast for cash flows, there is no need for an additional markup of the cost of capital if the risk is diversifiable.

There is no systematic method to estimate a country risk premium In our example, we could simply reengineer the country risk premium because the true value of the plant was already known from the scenario approach. But for practical purposes, there is no agreed-upon approach to estimate the premium. Estimates from different analysts usually fall into a wide range because of the different methods used.[8] The country risk premium is sometimes set at the

[8] For an overview, see, for example, L. Pereiro, *Valuation of Companies in Emerging Markets: A Practical Approach* (New York: John Wiley & Sons, 2002), 118.

EXHIBIT 31.6 **Expectations of Failure Implied by Small Changes in Discount Rate**

Probability of lower cash flow, %	Size of cash-flow reduction, % 20	40	60	80	100
10	0.1	0.2	0.4	0.5	0.7
20	0.2	0.5	0.8	1.1	1.5
30	0.4	0.8	1.3	1.9	2.6
40	0.5	1.1	1.9	2.8	4.0
50	0.7	**1.5**	2.6	4.0	**6.0**

A 1.5% risk premium is assuming even odds that an investment will lose 40% of its value.

A 6% risk premium is assuming even odds it will lose all its value.

Assuming a smooth cash-flow profile, 8% weighted average cost of capital, 2% terminal growth, binomial outcome.

Source: R. Davis, M. Goedhart, and T. Koller, "Avoiding a Risk Premium That Unnecessarily Kills Your Project," *McKinsey Quarterly* (August 2012).

so-called sovereign risk premium: the spread of the local government bond yield denominated in U.S. dollars and a U.S. government bond of similar maturity.[9] However, that is reasonable only if the returns on local government debt are highly correlated with returns on corporate investments. In our experience, this is rarely the case.

Many country risks apply unequally to companies in a given country For example, banks are more likely to be affected than retailers. Some companies (raw-materials exporters) might benefit from a currency devaluation, while others (raw-materials importers) will be damaged. For the consumer goods company in Exhibit 31.5, economic crises had only a short-term impact on sales and profit as measured in the parent's domestic, stable currency. In most cases, after a year or two, sales and profits roughly regained their original growth trajectories. Applying the same risk premium to all companies in an emerging market likely overstates the risk for some businesses and understates it for others.

Risk premiums are easily overestimated Managers easily underestimate the impact that even a small country risk premium in the discount rate may have on valuations: in the example shown in Exhibit 31.4, setting a country risk premium of 3 percent would be equivalent to assuming a 70 percent probability of economic distress. Exhibit 31.6 gives an indication of the premium required for different combinations of the probability and size of an investment's permanent cash flow reduction. The premium is easily overestimated. For example,

[9] The local government bond yield is a promised yield rather than an expected yield on government bonds, further underlining the point that the cost of capital based on country risk premium should be applied not to expected cash flows, but to promised cash flows (those following a business-as-usual scenario in which no country risk materializes).

if there is a probability of 50 percent that future cash flows will be permanently lower by 40 percent, the risk premium should be just 1.5 percentage points. Actual premiums will also vary depending on the underlying cash flow profile and cost of capital.[10] Nevertheless, the table allows for some calibration of premiums and risks.

Country risk premiums do not provide insights From an operational viewpoint, when managers have to discuss emerging-market risks and their effect on cash flows in scenarios, they gain more insights than they would get from a so-called black-box addition to the discount rate. By identifying specific factors with a large impact on value, managers can plan to mitigate these risks.

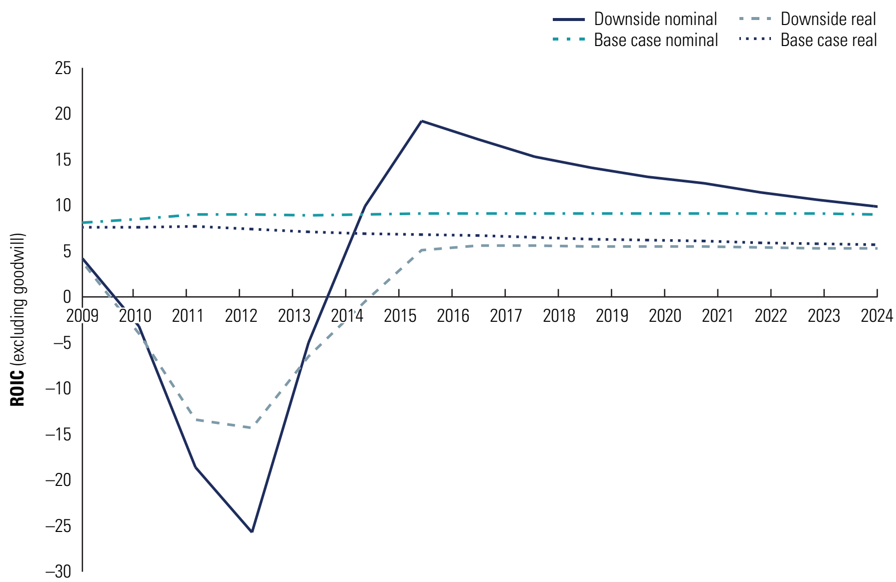
Constructing Cash Flow Scenarios and Probabilities

Our set of macroeconomic and monetary assumptions for the ConsuCo base-case scenario appears in Exhibit 31.2. Next, it was necessary to develop assumptions for the downside scenario—and ensure that they were consistent. For example, when we created a downside scenario due to high inflation, the inflation rates driving the company's revenues and costs had to equal those underlying its costs of capital estimates. To construct ConsuCo's cash flow forecasts in a downside scenario, we analyzed its performance under more adverse economic conditions in prior years. Brazil has experienced several severe economic and monetary downturns, including an inflation rate that topped 2,000 percent in 1993. Judging by its key financial indicators, such as EBITDA to sales and real-terms sales growth, the impact on ConsuCo's business performance had been significant. ConsuCo's cash operating margin had been negative for four years, at around –10 to –5 percent, before recovering to its normal levels. In the same period, sales in real terms declined by 10 to 15 percent per year but grew sharply after the crisis. For the downside-scenario projections, we assumed similar negative cash margins and a decline in sales, in real terms, for up to five years, followed by a gradual return to the long-term margins and growth assumed under the business-as-usual scenario. Exhibit 31.7 compares the nominal and real returns on invested capital under both scenarios.

In the downside scenario, the returns plummet and then increase as the recovery starts. After 2014, the nominal returns overtake those in the base case, as extreme inflation pushes up capital turnover. Of course, the nominal returns are artificially high, as a comparison with the real returns shows. The DCF value in the downside scenario turned out to be just under half of the base case value. Free cash flow would be negative by several billion reais, which would put a strong financing burden on ConsuCo: under such a scenario, ConsuCo would probably have to revise its growth strategy.

[10]The higher a cash flow's growth rate, the stronger is the impact of a risk premium on the DCF value.

EXHIBIT 31.7 **ConsuCo: ROIC and Financials, Base Case vs. Downside Scenario**



Financials, %	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Nominal indicators: Base case						
Sales growth	15.3	14.5	13.6	12.6	11.7	10.8
Adjusted EBITA/sales	6.1	6.2	6.4	6.4	6.4	6.4
NOPLAT/sales	4.4	4.5	4.6	4.5	4.4	4.4
Invested capital (excluding goodwill)/sales	54	53	51	51	50	49
Invested capital (including goodwill)/sales	62	59	57	56	55	54
ROIC (excluding goodwill)	8.1	8.5	9.0	9.0	8.9	9.0
Free cash flow, reais million	(63)	(136)	(94)	(91)	(85)	113
Nominal indicators: Downside scenario						
Sales growth	10.0	25.0	66.3	66.3	25.0	11.3
Adjusted EBITA/sales	3.1	(2.2)	(8.0)	(7.6)	(1.1)	3.3
NOPLAT/sales	2.3	(1.5)	(5.8)	(5.8)	(1.1)	2.2
Invested capital (excluding goodwill)/sales	55	47	31	22	21	22
Invested capital (including goodwill)/sales	63	54	35	25	23	24
ROIC (excluding goodwill)	4.2	(3.2)	(18.6)	(25.7)	(5.0)	9.9
Free cash flow, reais million	(149)	(777)	(2,533)	(4,504)	(2,677)	(558)

While estimating probabilities of economic distress for the base-case and downside scenarios is ultimately a matter of management judgment, there are indicators to suggest reasonable probabilities. Historical data on previous crises can give some indication of the frequency and severity of country risk and the time required for recovery. We analyzed the changes in GDP of 20 emerging economies since 1985 and found that they had experienced economic distress, defined as a real-terms GDP decline of more than 5 percent, about once every five years. This would suggest a 20 percent probability for a downside scenario.

Another source of information for estimating probabilities is prospective data from current government bond prices.[11] Academic research suggests that government default probabilities in emerging markets such as Argentina five years into the future were around 30 percent in nondistress years.[12] We estimated about a 30 percent probability of the downside scenario materializing for ConsuCo.

ESTIMATING COST OF CAPITAL IN EMERGING MARKETS

Calculating the cost of capital in any country can be challenging, but for emerging markets, the challenge is an order of magnitude higher. This section provides our fundamental assumptions, background on the important issues, and a practical way to estimate the components of the cost of capital.

General Guidelines

Our analysis adopts the perspective of a global investor—either a multinational company or an international investor with a diversified portfolio. Of course, some emerging markets are not yet well integrated with the global market, and local investors may face barriers to investing outside their home market. As a result, local investors cannot always hold well-diversified portfolios, and their cost of capital may be considerably different from that of a global investor. Unfortunately, there is no established framework for estimating the capital cost for local investors. Furthermore, as long as international investors have access to local investment opportunities, local prices will be based on an international cost of capital. Finally, according to empirical research, emerging markets have become increasingly integrated into global capital markets.[13] We believe that this trend will continue and that most countries will over the long run gradually reduce foreign-investment restrictions for local investors.

Another assumption is that most country risks are diversifiable from the perspective of the global investor. We therefore need no additional risk premiums in the cost of capital for the risks encountered in emerging markets when discounting expected cash flows in the scenario DCF approach. Of course, if you choose to discount the promised cash flow from the business-as-usual scenario only, you should add a separate country risk premium.

[11] See, for example, D. Duffie and K. Singleton, "Modeling Term Structures of Defaultable Bonds," *Review of Financial Studies* 12 (1999): 687–720; and R. Merton, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance* 29, no. 2 (1974): 449–470.
[12] See J. Merrick, "Crisis Dynamics of Implied Default Recovery Ratios: Evidence from Russia and Argentina," *Journal of Banking and Finance* 25, no. 10 (2001): 1921–1939.
[13] See, for example, C. Harvey, "The Drivers of Expected Returns in International Markets," *Emerging Markets Quarterly* (Fall 2000): 1–17.

Given these assumptions, the cost of capital in emerging markets should generally be close to a global cost of capital adjusted for local inflation and capital structure. It is also useful to keep some general guidelines in mind:

- *Use the capital asset pricing model (CAPM) to estimate the cost of equity in emerging markets.* The CAPM may be a less robust model for the less integrated emerging markets, but there is no better alternative model today. Furthermore, we believe it will become a better predictor of equity returns worldwide as markets continue to become more integrated.
- *There is no one right answer, so be pragmatic.* In emerging markets, there are often significant gaps in information and data (for example, in estimating betas or the risk-free rate in local currency). Be flexible as you assemble the available information piece by piece to build the cost of capital, and triangulate your results with country risk premium approaches and multiples.
- *Be sure monetary assumptions are consistent.* Ground your model in a common set of monetary assumptions to ensure that the cash flow forecasts and discount rate are consistent. If you are using local nominal cash flows, the cost of capital must reflect the local inflation rate embedded in the cash flow projections. For real-terms cash flows, subtract inflation from the nominal cost of capital.
- *Allow for changes in cost of capital.* The cost of capital in an emerging-market valuation may change, based on evolving inflation expectations, changes in a company's capital structure and cost of debt, or foreseeable reforms in the tax system. For example, in Argentina during the economic and monetary crisis of 2002, the short-term inflation rate was 30 percent. This could not have been a reasonable rate for a long-term cost of capital estimate, because such a crisis could not be expected to last forever.[14] In such cases, estimate the cost of capital on a year-by-year basis, following the underlying set of basic monetary assumptions.
- *Don't mix approaches.* Use the cost of capital to discount the cash flows in a scenario DCF approach. Do not add any risk premium, because you would then be double-counting risk. If you are discounting only future cash flows in a business-as-usual scenario, add a risk premium to the discount rate.

Estimating the Cost of Equity

To estimate the components of the cost of equity, use the standard CAPM described in Chapter 13. We continue the ConsuCo example to show how the

[14] Annual consumer price inflation came down to around 5 percent in Argentina in 2004.

procedure applies to estimation of the risk-free rate, beta, and market risk premium, as well as the computation of cost of equity from those estimates.

Risk-free rate In emerging markets, it is harder than in developed markets to estimate the risk-free rate from government bonds. Three main problems arise. First, most of the government debt in emerging markets is not, in fact, risk free: the ratings on much of this debt are often well below investment grade. Second, it is difficult to find long-term government bonds that are actively traded with sufficient liquidity. Finally, the long-term debt that is traded is often in U.S. dollars, a European currency, or the Japanese yen, so it is not appropriate for discounting local nominal cash flows.

We recommend a straightforward approach. Start with a risk-free rate based on the 10-year U.S. government bond yield, as in developed markets. Add to this the projected difference over time between U.S. and local inflation, to arrive at a nominal risk-free rate in local currency.[15] For emerging-market bonds with relatively low risk, you can derive this inflation differential from the spread between local bond yields denominated in local currency and those denominated in U.S. dollars.

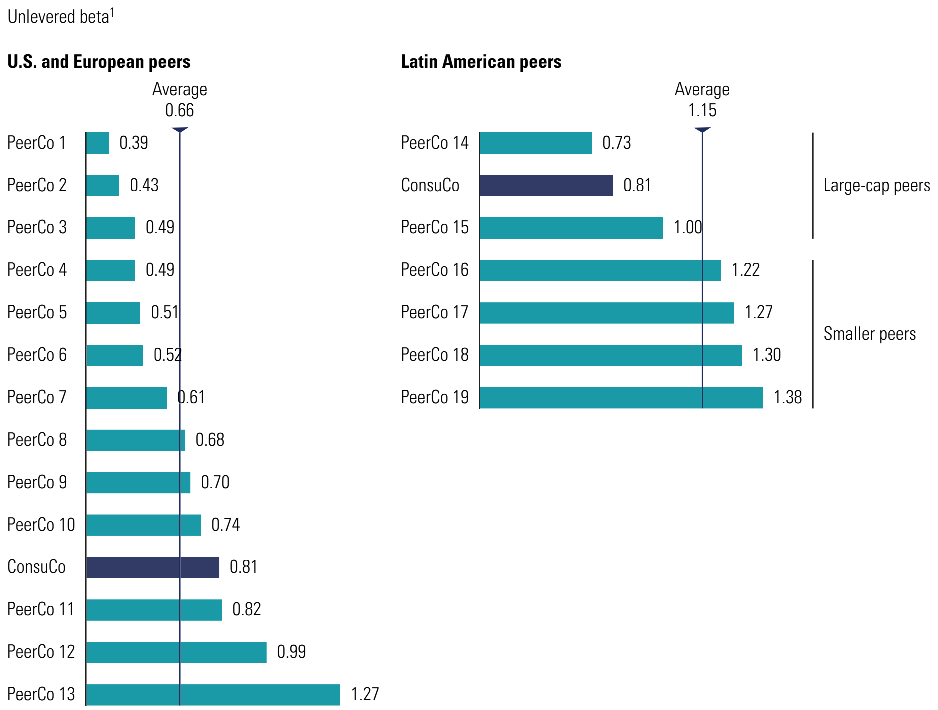
Beta Sometimes practitioners calculate beta relative to the local market index. This is not only inconsistent from the perspective of a global investor, but also potentially distorted by the fact that the index in an emerging market will rarely be representative of a diversified economy. Instead, estimate industry betas relative to a well-diversified or global market index as recommended in Chapter 13.

To estimate the beta for ConsuCo, we examined its own beta and those of peer companies, just as we would in the case of a company from a developed market. We estimated the asset betas for retail companies in the United States and Europe but also for several larger retail companies in Latin America. We looked at long-term historical average betas to avoid distortion due to the 2008 economic crisis. The results are presented in Exhibit 31.8. The average beta of U.S. and European retail companies is around 0.7. For the Latin American peers, betas appear to be much higher, but large-cap retailers more similar in size to ConsuCo have betas in the range of 0.7 to 1.0. Given that ConsuCo's own beta estimate at 0.81 is also in that range, it seems appropriate to use a beta in a range of 0.7 to 1.0, above the U.S. and European peer group.

Unfortunately, ConsuCo's Latin American peer group of large retailers is very small, because it is generally harder to find a sizable sample of publicly traded local peer companies in emerging markets. In such cases, we suggest you triangulate your results by examining the betas of broader sector indexes. Exhibit 31.9 compares the beta estimates of the consumer goods and services

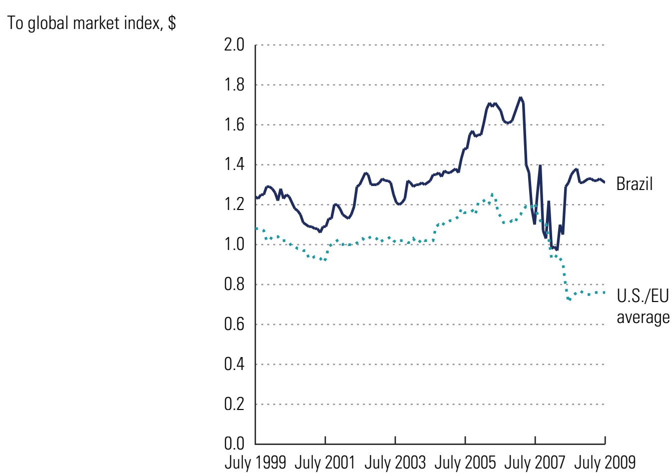
[15]Technically, we should also model the U.S. term structure of interest rates, but it will not make a large difference in the valuation.

EXHIBIT 31.8 **ConsuCo: Estimating Beta**



[1] Based on beta development since January 2005, with beta calculated from 5 years of monthly data in dollars.
Source: Datastream.

EXHIBIT 31.9 **Consumer Sector Betas[1]**



[1] Beta calculated from 5 years of monthly data in dollars.
Source: Datastream.

EXHIBIT 31.10 **ConsuCo: Cost of Equity Estimates, Base Case**

%

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
United States										
Inflation	0.1	1.1	1.3	1.5	1.7	1.9	...	1.9	...	1.9
Risk-free interest rate	4.0	4.0	4.0	4.0	4.0	4.0	...	4.0	...	4.0
Brazil										
Inflation	4.8	4.1	4.2	4.3	4.4	4.5	...	4.5	...	4.5
Risk-free interest rate[1]	8.9	7.1	7.0	6.9	6.8	6.7	...	6.7	...	6.7
Relevered beta	0.80	0.80	0.80	0.80	0.80	0.80	...	0.80	...	0.80
Market risk premium	5.0	5.0	5.0	5.0	5.0	5.0	...	5.0	...	5.0
Cost of equity	13.1	11.2	11.1	11.0	10.9	10.8	...	10.8	...	10.8

[1] Brazilian risk-free rate estimated as: [(1 + U.S. risk-free rate)(1 + U.S. inflation)]/(1 + Brazilian inflation) – 1.
Source: International Monetary Fund *World Economic Outlook*, Bloomberg.

sector (which includes more than retail companies) in Brazil versus the United States and Europe. It shows that in recent history, the beta for the Brazilian sector was at a fairly consistent premium of around 25 percent relative to that of the U.S. and European sectors.[16]

Gathering all the evidence together, we estimate ConsuCo's beta at 0.8, which happens to be equal to its own beta estimate. It corresponds to a 25 percent premium to the average asset beta for the U.S. and European retail peers and is in line with the betas of ConsuCo's larger Latin American peers.

Market risk premium As discussed in Chapter 23, excess returns of local equity markets over local bond returns are not a good proxy for the market risk premium. This holds even more so for emerging markets, given the lack of diversification in the local equity market. Furthermore, the quality and the length of available data on equity and bond market returns usually make such data unsuitable for long-term estimates. To use a market risk premium that is consistent with the perspective of a global investor, use a global estimate (as discussed in Chapter 13) of 4.5 to 5.5 percent.

Exhibit 31.10 summarizes the nominal cost of equity calculation for ConsuCo in line with the inflation and risk-free rate assumptions in the base-case scenario.

[16] Do not confuse this beta markup for Latin American retail companies with the country risk premium, discussed in the next section. The beta markup could reflect differences in business models or indeed a systematic component of country risk. In either case, it represents risk for which investors require a higher expected return. The recommended valuation approach remains unchanged: forecast future scenarios for cash flow and scenario probabilities, and then discount the expected future cash flows at the cost of capital based on your beta estimate.

EXHIBIT 31.11 **ConsuCo: Cost of Debt Estimates, Base Case**

%

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Risk-free interest rate	8.9	7.1	7.0	6.9	6.8	6.7	...	6.7	...	6.7
A to BBB credit spread	1.0	1.0	1.0	1.0	1.0	1.0	...	1.0	...	1.0
Cost of debt	9.9	8.1	8.0	7.9	7.8	7.7	...	7.7	...	7.7
Tax rate	34	34	34	34	34	34	...	34	...	34
After-tax cost of debt	6.5	5.3	5.3	5.2	5.1	5.1	...	5.1	...	5.1

Source: Bloomberg.

Estimating the After-Tax Cost of Debt

In most emerging economies, there are no liquid markets for corporate bonds, so little or no market information is available to estimate the cost of debt. However, from an international investor's perspective, the cost of debt in local currency should simply equal the sum of the dollar (or euro) risk-free rate, the systematic part of the credit spread (which depends on the beta of the debt; see Chapter 13, footnote 29), and the inflation differential between local currency and dollars (or euros). Most of the country risk can be diversified away in a global bond portfolio. Therefore, the systematic part of the default risk is probably no larger than that of companies in international markets, and the cost of debt should not include a separate country risk premium.[17]

Returning to the ConsuCo example, we calculated the cost of debt in Brazilian reais. ConsuCo does not have its own credit rating, but based on comparison with peers, we estimated that ConsuCo would probably have a rating of BBB to A. ConsuCo's cost of debt can be estimated as the sum of the risk-free rate in Brazilian reais plus the systematic credit spread for U.S. and European corporate bonds rated BBB to A versus the government bond yield. Exhibit 31.11 shows the cost of debt estimates for ConsuCo following the inflation and risk-free rate assumptions for the base-case scenario.

The marginal tax rate in emerging markets can be very different from the effective tax rate, which often includes investment tax credits, export tax credits, taxes, equity or dividend credits, and operating loss credits. Few of these arrangements provide a tax shield on interest expense, and only those few should be incorporated in the after-tax cost of debt component of the WACC. Other taxes or credits should be modeled directly in the cash flows. For ConsuCo, we used the Brazilian corporate income tax rate of 25 percent plus social contribution tax of 9 percent.

[17]This explains why multinationals with extensive emerging-market portfolios—companies such as Coca-Cola and Colgate-Palmolive—have a cost of debt that is no higher than that of their mainly U.S.-focused competitors.

EXHIBIT 31.12 **ConsuCo: WACC Estimates**

%

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Base case										
After-tax cost of debt	6.5	5.3	5.3	5.2	5.1	5.1	...	5.1	...	5.1
Cost of equity	13.1	11.2	11.1	11.0	10.9	10.8	...	10.8	...	10.8
Debt/enterprise value	30	30	30	30	30	30	...	30	...	30
WACC	11.1	9.4	9.3	9.2	9.1	9.0	...	9.0	...	9.0
Downside scenario										
After-tax cost of debt	6.5	19.7	53.7	53.5	19.2	5.4	...	5.1	...	5.1
Cost of equity	13.1	33.5	86.6	86.2	32.7	11.3	...	10.8	...	10.8
Debt/enterprise value	30	30	30	30	30	30	...	30	...	30
WACC	11.1	29.4	76.7	76.4	28.7	9.5	...	9.0	...	9.0

Estimating WACC

Having estimated the cost of equity and after-tax cost of debt, we need debt and equity weights to derive an estimate of the weighted average cost of capital. In emerging markets, many companies have unusual capital structures compared with their international peers. One reason is, of course, the country risk: the possibility of macroeconomic distress makes companies more conservative in setting their leverage. Another reason could be anomalies in the local debt or equity markets. In the long run, when the anomalies are corrected, the companies should expect to develop a capital structure similar to that of their global competitors. You could forecast explicitly how the company evolves to a capital structure that is more similar to global standards. In that case, you should consider using the adjusted present value (APV) approach discussed in Chapter 8.

For the ConsuCo case, we set the capital structure close to the peer group average at a ratio of debt to enterprise value of 0.3, which was also in line with its long-term historical levels. Exhibit 31.12 summarizes the resulting WACC estimates for the base case and the downside scenario in nominal terms. Note how the extreme inflation assumption underlying the downside scenario led to a radically higher cost of capital in the crisis years until 2014, when it was forecast to start falling.

Estimating the Country Risk Premium

If you are discounting business-as-usual cash flows instead of expected cash flows, you should add a country risk premium to the WACC, as seen earlier in this chapter in the section on incorporating emerging-market risks in the valuation.

In many cases, analysts simply apply the sovereign risk premium, but this is typically too high for companies in the consumer goods sector such as ConsuCo, which are only weakly correlated with local government bond payments and also are less volatile. Analysts using high premiums frequently compensate by making aggressive forecasts for growth and ROIC. An example is the valuation we undertook of a large Brazilian chemicals company. Using a local WACC of 10 percent, we reached an enterprise value of 4.0 to 4.5 times EBITDA. A second adviser was asked to value the company and came to a similar valuation—an EBITDA multiple of around 4.5—in spite of using a very high country risk premium of 11 percent on top of the WACC. The result was similar because the second adviser made performance assumptions that were far too aggressive: real sales growth of almost 10 percent per year and a ROIC increasing to 46 percent in the long term. Such long-term performance assumptions are unrealistic for a commodity-based, competitive industry such as chemicals.

Using Exhibit 31.6, we can obtain more reasonable estimates for ConsuCo's country risk premium. For example, we already observed that the probability of country crises appears to be around 20 to 30 percent and that for consumer goods businesses, it rarely leads to a loss of all cash flows. Taking that into account, a country risk premium for a Brazilian retailer like ConsuCo was more likely in the range of 1 to 2 percent, rather than 5 percent and higher, as analysts often estimate.

CALCULATING AND INTERPRETING RESULTS

Given the estimates for cash flow and the cost of capital, we could discount the free cash flows for ConsuCo under the base case and the downside scenario. The resulting present values of operations are shown in Exhibit 31.13. Under each scenario, the valuation results are exactly the same for the nominal and real projections. The next step is to weight the valuation results by the scenario probabilities and derive the present value of operations. Finally, add the market value of the nonoperating assets, and subtract the financial claims to get at the estimated equity value. The estimated equity value obtained for ConsuCo was about 32 reais per share, given a 30 percent probability of economic distress. This was somewhat lower than ConsuCo's share price in the stock market of around 37 reais at the time of valuation (October 2009) but clearly above the 20 to 25 reais price range in the preceding three years.

In contrast to share prices in developed markets, share prices in emerging markets are not always reliable references for intrinsic value, for several reasons. First, free float is often limited, with large equity stakes in the hands of a small group of owners, leaving public shareholders with little or no influence. As a result, the share price in the market could well be below intrinsic value estimated using a DCF analysis. Also, liquidity in emerging-market stocks is often much lower than in developed markets. Share prices may not fully reflect

EXHIBIT 31.13 **ConsuCo: Scenario DCF Valuation**

reais, million

Value per share 32

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Base case										
Nominal projections										
Free cash flow	(63)	(136)	(94)	(91)	(85)	113	...	301	...	516
WACC, %	11.1	9.5	9.3	9.2	9.1	9.0	...	9.0	...	9.0
Real projections										
Free cash flow	(60)	(125)	(83)	(77)	(68)	87	...	187	...	257
WACC, %	6.0	5.1	4.9	4.7	4.5	4.4	...	4.4	...	4.4

Probability 70%

DCF value	14,451
Nonoperating assets	1,139
Debt and debt equivalents	(5,605)
Equity value	9,985
Value per share	42.4

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Downside scenario										
Nominal projections										
Free cash flow	(149)	(777)	(2,533)	(4,504)	(2,677)	(558)	...	250	...	834
WACC, %	11.1	29.4	76.7	76.4	28.7	9.5	...	9.0	...	9.0
Real projections										
Free cash flow	(142)	(593)	(1,105)	(1,123)	(534)	(106)	...	38	...	102
WACC, %	6.0	3.5	1.0	0.8	2.9	4.3	...	4.4	...	4.4

Probability 30%

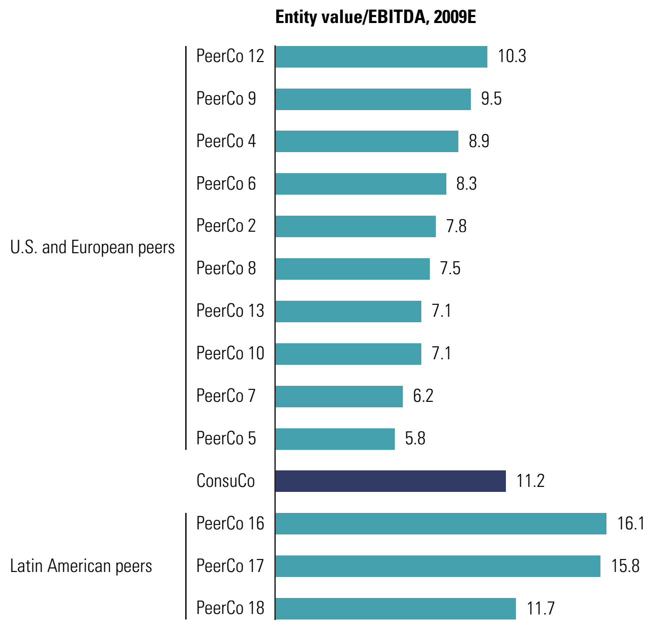
DCF value	6,313
Nonoperating assets	1,139
Debt and debt equivalents	(5,605)
Equity value	1,847
Value per share	7.9

intrinsic value, because not all information is incorporated in the market value. Finally, share prices in emerging markets are often much more volatile than in developed markets. The share price on any particular day could therefore be some way off intrinsic value.

Triangulating with Multiples and Country Risk Premium Approach

To triangulate with multiples, we apply Chapter 16's guidance on how to perform a best-practice multiples analysis to check valuation results. For the ConsuCo example, we compared the implied multiple of enterprise value over EBITDA with those of peer companies. All multiples were forward-looking multiples over EBITDA as expected for 2009. As Exhibit 31.14 illustrates, the implied multiple from our ConsuCo valuation was significantly higher than for U.S. and European peers, which was not surprising given its higher growth outlook in the Brazilian market, compared with that of large established chains

EXHIBIT 31.14 **ConsuCo: Multiples Analysis vs. Peers**



in the U.S. and European markets. Consuco's valuation was at the low end of the range for Latin American peers, which was also not unreasonable. Relative to regional peers, ConsuCo could have been expected to have fewer growth opportunities, as it was already very well established and geographically widespread. It also had somewhat more exposure than listed peers had to the lower-growth food segment.

The last part of the triangulation consisted of valuing ConsuCo using a country risk premium approach. Earlier in this chapter, we estimated the country risk premium for ConsuCo at around 1 to 2 percent. Discounting the business-as-usual scenario at the cost of capital plus a country risk premium in this range led to a value per share below 20 reais, far lower than the 32-reais result obtained in the scenario DCF approach. The reason for this gap lies in ConsuCo's cash flow profile, and it highlights why a scenario approach is preferable to using a discount rate reflecting a country risk premium. Due to ConsuCo's high anticipated growth and corresponding investments, its free cash flows were forecast to be negative for the first five years, pushing value creation forward in time. But the further ahead a company's positive cash flows, the more those cash flows are penalized by the country risk premium approach because a markup in WACC accumulates over time. This does not happen in a scenario approach, because the scenario probabilities affect all future cash flows equally.

If ConsuCo had had a lower-growth outlook, the country risk premium approach would have produced a valuation much closer to the valuation from the scenario approach. Note that irrespective of ConsuCo's cash flow profile, a risk premium of 5 percent (as is typically used in emerging markets such as Brazil) would have either resulted in unrealistically low valuations relative to current share price and peer group multiples or else required an unrealistically bullish forecast of future performance.

SUMMARY

To value companies in emerging markets, we use concepts similar to the ones applied to developed markets. However, applying these concepts can be somewhat different. Inflation, which is often high in emerging markets, should be factored into the cash flow projections, using a combination of insights from both real and nominal financial analyses. Emerging-market risks such as macroeconomic or political crises can be incorporated by following the scenario DCF approach. This develops alternative scenarios for future cash flows, discounts the cash flows at the cost of capital without a country risk premium, and then weights the DCF values by the scenario probabilities. The cost of capital estimates for emerging markets build on the assumption of a global risk-free rate, market risk premium, and beta, following guidelines similar to those used for developed markets. Since company values in emerging markets are often more volatile than values in developed markets, we recommend triangulating the scenario DCF results with two other valuations: one based on discounting cash flows developed in a business-as-usual projection but using a cost of capital that includes a country risk premium, and another valuation based on multiples.

32

Valuing High-Growth Companies

Valuing high-growth, high-uncertainty companies is a challenge; some practitioners have even described it as hopeless. We find, however, that the valuation principles in this book work well even for high-growth companies, defined as those whose organic revenue growth exceeds 15 percent annually. The best way to value such companies is with a discounted-cash-flow (DCF) valuation, buttressed by economic fundamentals and probability-weighted scenarios.

Although scenario-based DCF may sound suspiciously retro, it works where other methods fail, since the core principles of economics and finance apply even in uncharted territory. Alternatives, such as price-to-earnings (P/E) multiples, generate imprecise results when earnings are highly volatile, cannot be used when earnings are negative, and provide little insight into what drives the company's valuation. More important, these shorthand methods cannot account for the unique characteristics of each company in a fast-changing environment. Another alternative, real options, still requires estimates of the long-term revenue growth rate, long-term volatility of revenue growth, and profit margins—the same requirements as for discounted cash flow.[1]

Since DCF remains our preferred method, why dedicate a chapter to valuing high-growth companies? Although the components of valuation are the same, their order and emphasis differ from the traditional process for established companies. This chapter details the differences. Instead of analyzing the company's past performance, start by examining the expected long-term development of the company's markets and then work backward. In addition, since long-term projections are highly uncertain, always create

[1] In Chapter 35, we demonstrate how real options can lead to a more theoretically robust valuation than scenario analysis. But unlike scenario analysis, real-options models are complex and obscure the competitive dynamics driving a company's value.

multiple scenarios. Each scenario details how the market might develop under different conditions. Nevertheless, while scenario-based DCF techniques can help bound and quantify uncertainty, they will not make it disappear: high-growth companies have volatile stock prices for sound reasons.

A VALUATION PROCESS FOR HIGH-GROWTH COMPANIES

When valuing an established company, the first step is to analyze historical performance. But in the case of a high-growth company, historical financial results provide limited clues about future prospects. Therefore, begin with the *future*, not with the past. Focus on sizing the potential market, predicting the level of sustainable profitability, and estimating the investments necessary to achieve scale. To make these estimates, choose a point well into the future at a time when the company's financial performance is likely to stabilize, and begin forecasting.

Once you have developed a long-term future view, work backward to link the future to current performance. Current performance measured using accounting statements will mix together investments and expenses. When possible, capitalize hidden investments, even those expensed under traditional accounting rules.[2] This is challenging, as the distinction between investment and expense is often unobservable and subjective.

Given the uncertainty associated with high-growth companies, do not rely on a single long-term forecast. Describe the market's development in terms of multiple scenarios, including total size, likely competitive structure, and so on. When you build a comprehensive scenario, be sure all forecasts, including revenue growth, profitability margins, and required investment, are consistent with the underlying assumptions of the particular scenario. Apply probabilistic weights to each scenario, using weights that are consistent with long-term historical evidence on corporate growth. As we saw during the Internet run-up of the late 1990s, valuations that rely too heavily on unrealistic assessments can lead to overestimates of value, poor investment returns, and strategic errors.

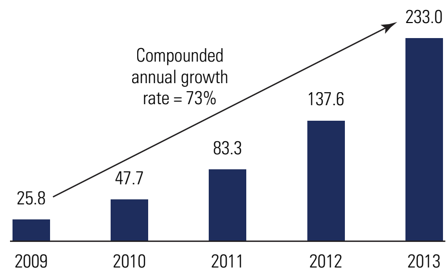
Start from the Future

When valuing high-growth companies, start by thinking about what the industry and company might look like as the company evolves from its current high-growth, uncertain condition to a sustainable, moderate-growth state in the future. Then interpolate back to current performance. The future state should be defined and bounded by measures of operating performance, such as customer penetration rates, average revenue per customer, and sustainable

[2]Chapter 21 presents a methodology for capitalizing intangible expenses, such as research and development.

EXHIBIT 32.1 **Yelp: Revenues**

$ million



	2009	2010	2011	2012	2013
Growth, %	113	85	74	65	69

Source: Yelp 2013 10-K.

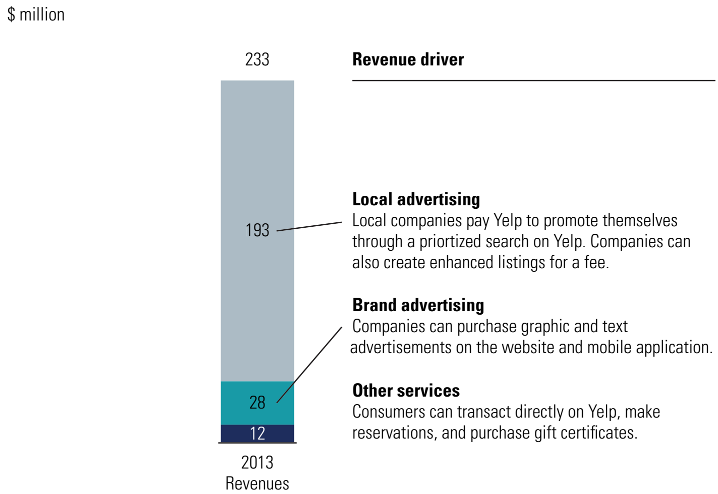
margins. Next, determine how long hyper-growth will continue before growth stabilizes to normal levels. Since most high-growth companies are start-ups, stable economics probably lie at least 10 to 15 years in the future.

To demonstrate the valuation process for high-growth companies, let's examine Yelp, a popular online site for reviewing local businesses. As of 2013, approximately 120 million unique visitors wrote 17 million reviews on 1.5 million businesses. As the company explains in its 2013 annual report, "These reviews are written by people using Yelp to share their everyday local business experiences, giving voice to consumers and bringing word of mouth online." Originating in San Francisco, the company now serves 61 cities in the United States and 56 markets internationally. Exhibit 32.1 presents Yelp's revenues between 2009 and 2013. Over this period, revenues grew nearly tenfold from just under $26 million to $233 million, representing a compound annual growth rate of 73 percent.

To estimate the size of a potential market, start by assessing how the company fulfills a customer need. Then determine how the company generates (or plans to generate) revenues. Understanding how a start-up makes money is critical. Many young companies build a product or service that meets the customer's need but cannot identify how to monetize the value they provide. Yelp provides end users with an extensive online forum to review the experiences of other customers when selecting a local business. Although Yelp provides a convenient service to the customer, today's Internet users do not pay for online reviews.[3]

[3] Although free reviews are commonplace today, this has not always been the case. Professional reviewers such as the magazine *Consumer Reports* (for products) and Zagat (for restaurants) historically have charged for their service.

EXHIBIT 32.2 **Yelp: Revenue Model, 2013**



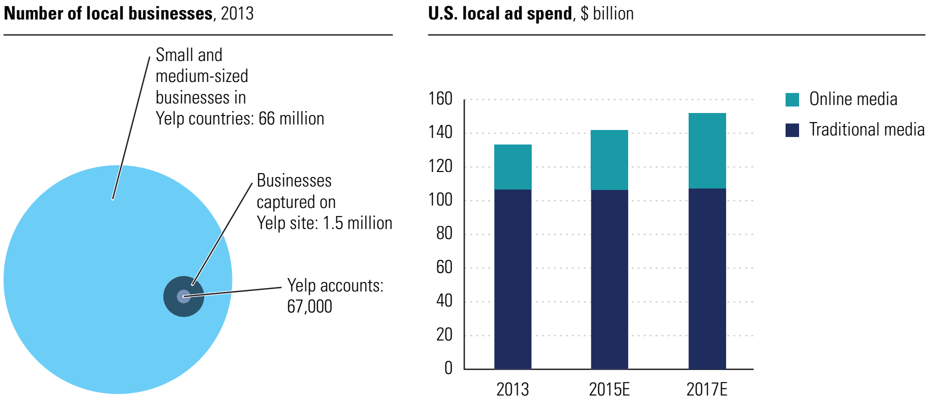
Source: Yelp 2013 10-K.

Instead of charging the end customer, Yelp sells local advertising to businesses that register on the website. A basic listing is free, but the company offers paid services, such as enhanced listings with photos and video, sponsored search (where the company appears early in the consumer's search results), and "call to action," which allows the consumer to schedule an appointment or the business to provide a coupon. As shown in Exhibit 32.2, local advertising contributes $193 million of the company's $233 million in revenues. The other two sources of revenues, brand advertising and other services, allow companies to purchase general advertisements and conduct transactions. Both are growing rapidly, but they continue to be a smaller part of revenues each year.

Using these revenue drivers as a guide, start your valuation by estimating the potential market, product by product. For the purpose of exposition, this chapter examines only one source of revenues for Yelp in detail: local advertising. We estimated the remaining two products (and future products) using a similar methodology, although the analysis is not presented here.

Sizing the market Although Yelp management rightfully touts its unique visitors and growing base of customer reviews, what really matters from a valuation perspective is the company's ability to convert local businesses into Yelp clients. Therefore, a good forecast starts with an assessment of how many local businesses exist in Yelp's target markets, how many businesses will register with Yelp, and how many of those businesses will convert to its paid services. Exhibit 32.3 presents a graphic demonstrating Yelp's relatively small penetration of its potential market. According to a 2014 investor presentation by

EXHIBIT 32.3 **Number of Local Businesses and Local Ad Spend**



Source: Yelp 2013 10-K, Yelp investor deck, Q3 2014, BIA/Kelsey.

Yelp, there are approximately 66 million small and medium-sized businesses in Yelp's target markets. As of 2013, the company had registered only 1.5 million businesses on its site. Of the businesses that registered on Yelp's website, only 67,000 were paying clients. With 0.1 percent global market penetration, this market is clearly ripe for growth.

In addition to estimating the number of potential clients, a good revenue forecast will also estimate the current and future amount of local advertising conducted by these businesses. For this, we rely on estimates by BIA/Kelsey, a research and advisory company that focuses on local advertising. In a 2013 report, BIA/Kelsey estimated that local businesses spent $132.9 billion on advertising, of which $26.5 billion was placed online.[4] Between 2013 and 2017, the research company expects online advertising to grow at 14 percent per year, to $44.5 billion. Although search engines such as Google will capture the lion's share of this market, other popular sites like Yelp will also capture a portion of local advertising. The tough question, of course, is how much.

One method to estimate Yelp's potential revenue is to examine the evolution of performance for cities in which the company has a presence. In the company's initial public offering (IPO) filing in February 2012, Yelp reported the markets it had entered between 2005 and 2009. We report active markets by cohort in Exhibit 32.4. In Yelp's first year (labeled cohort 1), the company focused solely on San Francisco. In 2006, the company entered Boston, Chicago, Los Angeles, New York, and Seattle. With nearly a decade of data, historical

[4] BIA/Kelsey, "BIA/Kelsey Forecasts Overall U.S. Local Media Ad Revenues to Reach $151.5B in 2017, Lifted by Faster Growth in Online/Digital," news release, November 19, 2013, www.biakelsey.com/Company/Press-Releases/131119-Overall-U.S.-Local-Media-Ad-Revenues-to-Reach-$151.5B-in-2017.asp.

EXHIBIT 32.4 **Yelp: Active Markets, 2005–2009**

	Cohort 1, 2005	**Cohort 2**, 2006	**Cohort 3**, 2007	**Cohort 4**, 2008	**Cohort 5**, 2009
New markets[1]	1	5	8	6	7
United States markets	San Francisco	Boston Chicago Los Angeles New York Seattle	Atlanta Austin Houston Phoenix Portland San Diego San Jose Washington, DC	Dallas Denver Detroit Miami Minneapolis Philadelphia	Honolulu Orlando Sacramento St. Louis
International markets					London Toronto Vancouver
Operating data, thousands of accounts:					
Claimed business locations	←	not meaningful	→	25	120
Active business accounts	←	not meaningful	→	4	7

[1] Yelp defines an active market as a city or region where the company has hired a community manager.
Source: Yelp Amendment No. 4 to Form S-1, February 16, 2012.

penetration rates would provide extremely useful insights. Unfortunately, the company does not disclose this data on such a fine-grained level. Therefore, we estimate cohort-by-cohort results by (imperfectly) fitting macroeconomic data to the company's helpful, but limited, disclosures.

Exhibit 32.5 presents a revenue model for Yelp, built cohort by cohort (only the first two cohorts are shown). To estimate and forecast the number of businesses in each market, we rely on population data from the U.S. Census and convert these figures into the number of local businesses by applying the average number of local businesses per capita. We next estimate both historical and future registration rates by fitting Yelp's historical data. Since registration is free and Yelp is well known, we model penetration to reach 65 percent.

For most start-ups, forecasting a 65 percent share is extremely aggressive, since additional competition is likely to enter the market.[5] For this business, however, the largest company is likely to capture a significant portion of the online market. Businesses desire a partner that generates the most traffic, and consumers desire a website with the most reviews. This business is similar to other software businesses, such as Microsoft's Windows operating system and IBM's MVS mainframe software, both of which still retain more than 80 percent of their respective markets.

[5]One piece of data pointing to the potential of a 65 percent share is the restaurant reservation company OpenTable. Before being acquired by Priceline in 2013, OpenTable reported that it had exceeded a 60 percent share in San Francisco.

EXHIBIT 32.5 **Yelp: Cohort Revenue Model**

	Historical[1]			Forecast				
	2011	2012	2013	2014	2015	2016	2017	2018
Cohort 1: San Francisco								
Addressable businesses, thousand	375.8	381.0	386.1	391.4	396.8	402.2	407.7	413.3
× Percent claimed	37.0	45.0	52.0	58.0	62.0	65.0	65.0	65.0
= Claimed locations, thousand	139.0	171.4	200.8	227.0	246.0	261.4	265.0	268.7
× Percent converted	4.3	4.4	4.6	4.7	4.8	4.9	5.0	5.1
= Active accounts, thousand	6.0	7.5	9.2	10.7	11.8	12.8	13.3	13.7
× Revenues per account, $ thousand	2.7	3.0	3.3	3.7	4.0	4.4	4.9	5.4
= Cohort revenue, $ million	16.0	22.9	30.8	39.2	47.7	56.9	64.7	73.6
Cohort 2: Boston, Chicago, Los Angeles, New York City, Seattle								
Addressable businesses	1,372.2	1,383.5	1,394.2	1,405.6	1,417.1	1,428.8	1,440.6	1,452.5
× Percent claimed	24.0	37.0	45.0	52.0	58.0	62.0	65.0	65.0
= Claimed locations, thousand	329.3	511.9	627.4	730.9	821.9	885.9	936.4	944.1
× Percent converted	4.1	4.3	4.4	4.6	4.7	4.8	4.9	5.0
= Active accounts, thousand	13.5	22.0	27.6	33.6	38.6	42.5	45.9	47.2
× Revenues per account, $ thousand	2.4	2.7	3.0	3.3	3.7	4.0	4.4	4.9
= Cohort revenue, $ million	31.8	59.1	83.7	112.2	141.8	171.7	203.8	230.6

[1] Yelp does not disclose historical data by cohort; we have estimated it here using publicly available data.

With registered businesses in hand, we next estimate the conversion rate from basic (free) to enhanced (pay) services. To estimate this number, we fit cohort-by-cohort data to annual conversion rates reported by Yelp. For instance, in 2012 Yelp reported 40,000 active accounts on 994,000 claimed locations. In 2013, this number grew to 67,000 active accounts on 1.5 million claimed locations. Based on historical data, we estimate each cohort's penetration rate to grow from 4 to 5 percent as the cohort matures. This number is quite conservative, but historical data have not pointed to much movement over time, even for Yelp's earliest markets.

We complete the forecast with an estimate of revenues per client. Again, data from early markets are relatively stable, averaging near $3,000 per business. Multiplying the number of businesses by the average revenue per business leads to revenue by cohort. Since each of these numbers is critical to the forecast, a good analysis will triangulate each projection using all available data, including future disclosures by the company.

To determine the company's aggregate revenues, we sum across both past and future cohorts. Exhibit 32.6 presents a summary of these results. In 2013, local advertising revenue totaled $193 million. Our base forecast grows local advertising revenue to almost $664 million by 2016 and $2,150 million by 2023. Revenue forecasts for Yelp's other two segments, brand advertising and other

EXHIBIT 32.6 **Yelp: Revenue Model**

$ million

	Historical[1]			Forecast				
	2011	2012	2013	2014	2015	2016	...	2023
Cohort 1	16.0	22.9	30.8	39.2	47.7	56.9	...	139.4
Cohort 2	31.8	59.1	83.7	112.2	141.8	171.7	...	425.8
Cohort 3	8.6	16.9	31.6	45.2	61.0	77.7	...	218.7
Cohort 4	2.1	5.0	9.8	18.3	26.0	34.9	...	105.3
Cohort 5	–	5.3	13.4	26.2	48.8	69.4	...	247.8
...	...	...	...	...	...	...	...	...
Cohort 10	0	0	0	0	0	0	...	356.5
Cohort 11	0	0	0	0	0	0	...	256.0
Local advertising	58.5	109.2	193.0	314.3	472.6	663.6	...	2,150.1
Revenues by business:								
Local advertising	58.5	109.2	193.0	314.3	472.6	663.6	...	2,150.1
Brand advertising	17.7	20.6	28.0	42.8	60.6	80.1	...	172.2
Other services	7.1	7.8	12.0	18.4	26.1	34.5	...	74.2
Yelp revenue	83.3	137.6	233.0	375.5	559.3	778.2	...	2,396.5

[1] Yelp does not disclose historical data by cohort; we have estimated it here using publicly available data.

services, are estimated as a portion of its core business. In sum, we forecast Yelp's aggregate revenues to grow from $233 million in 2013 to $2,396.5 million in 2023.

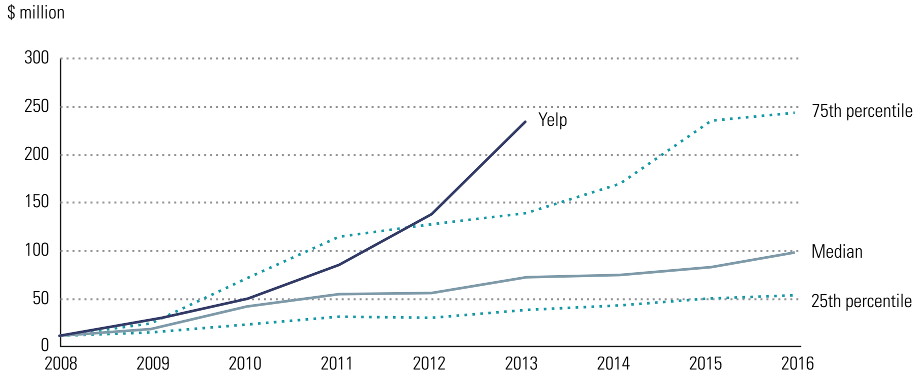
Sizing the potential market for Yelp requires numerous inputs, each of which is uncertain and in many cases based on limited data. Small miscalculations in individual forecast items can compound into large mistakes in the aggregate. Therefore, always search for clever checks to test your forecast.

One way to put Yelp's revenue growth in perspective is to compare it with the revenue growth for numerous Internet companies founded in the late 1990s. To do this, we compare Yelp's revenue with the first five years after each company hit $10 million in revenue (see Exhibit 32.7). Between 2009 and 2013, Yelp grew revenues from $12.1 million to $233.0 million, which outpaces even most of the best Internet companies passing the same threshold. Even so, Yelp still lags Google, the undisputed Internet leader, which reached $1.5 billion in its first five years.

Estimating operating margin, capital intensity, and ROIC With a revenue forecast in hand, next forecast long-term operating margins, required capital investments, and return on invested capital (ROIC). To estimate operating margin, triangulate between internal cost projections (versus market prices) and operating margins for established players.

In Yelp's case, the company has not disclosed internal cost forecasts, so we look to internal margin projections for OpenTable, another high-growth company actively serving businesses in local markets. OpenTable provides

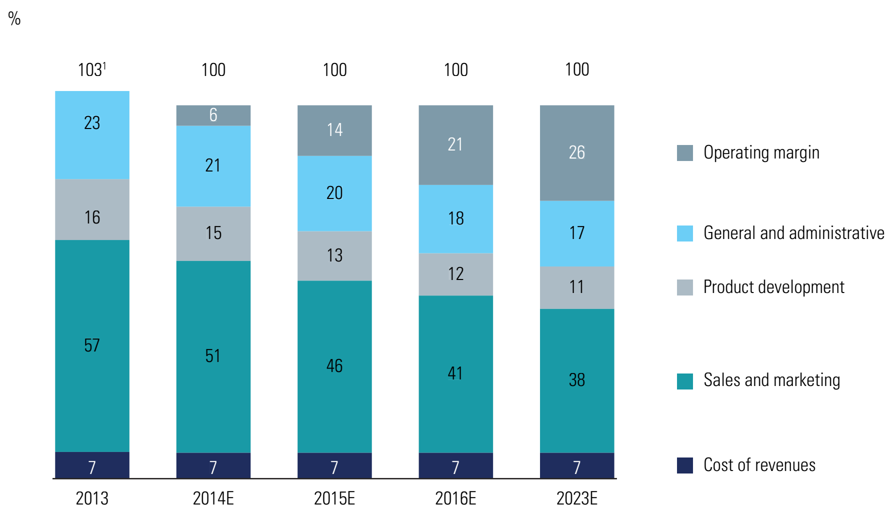
EXHIBIT 32.7 **Revenue Growth of Internet Start-Ups after Reaching $10 Million Threshold[1]**



[1] Sample of 75 publicly traded Internet start-ups, normalized to Yelp.

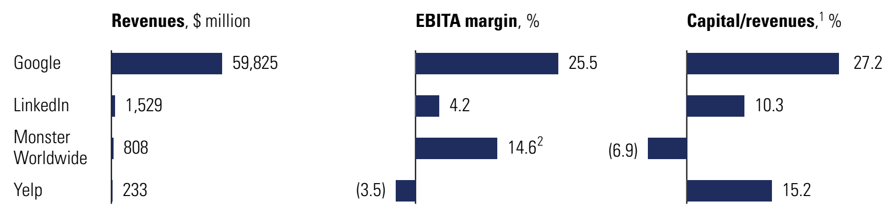
reservation services for restaurants. Similar to Yelp, the company generates revenue by deploying a dedicated sales team to local restaurants to encourage enrollment. Before Priceline acquired OpenTable, senior management at OpenTable discussed how economies of scale would lead to target margins above 25 percent. Executives forecast that every expense (operations, sales, technology, etc.) would drop as the company reaches scale. Exhibit 32.8

EXHIBIT 32.8 **Yelp: Current and Forecast Margins**



[1] Because Yelp operated at a loss in 2013, operating costs sum to greater than 100 percent.

EXHIBIT 32.9 **Business-to-Business Internet Companies: Key Value Drivers, 2013**



[1] Capital turnover excludes goodwill and acquired intangibles.
[2] Monster Worldwide EBITA margin includes only North America.

presents the margin transition for Yelp, from –3 percent in 2013 to an estimated 26 percent in 2023. Combined with our revenue forecast, our margin projections translate to a growth in operating profit from a loss of $8.1 million in 2013 to a profit of $619 million in 2023.

If Yelp follows OpenTable's pattern, margins could be above 25 percent. But are these forecasts realistic? To address this question, examine other software companies that provide a similar conduit between consumers and businesses, funded by businesses. Exhibit 32.9 presents the key value drivers for Yelp and three other companies: Google, LinkedIn, and Monster Worldwide. Although none of these companies provides a perfect comparison, each offers some insight into what is possible.

If Yelp can match Google, perhaps 25 percent operating margins are not unrealistic. But not every business-to-business Internet company has been able to maintain such healthy margins. For instance, Monster Worldwide generated operating margins near 30 percent prior to 2010 but has watched margins erode under competitive pressure. In 2013, domestic margins hovered near 15 percent, and the company's overall margin declined below 10 percent. Success with consumers by no means assures ongoing success with the businesses and, by extension, with financial results.

To estimate future cash flow, you must also forecast capital requirements. Most businesses require significant capital to grow. This is not the case for Internet companies. In 2013, Yelp required only $35.3 million of capital on $233.0 million of revenues, or 15.2 percent. Unlike traditional companies, which often consume significant capital as they grow, Internet companies require little fixed equipment; most of the capital resides in short-term assets such as accounts receivable. To create cash flow for Yelp, we maintained this percentage of invested capital to revenue. This percentage is in line with the comparables presented in Exhibit 32.9.

With high operating margins and little invested capital, return on invested capital (ROIC) is so high that it is no longer a useful measure. But what about the competition? If ROIC is so high, shouldn't competitors enter and eventually force prices down? Perhaps, but Yelp's real capital resides in intangibles such as brand and distribution capabilities, and these are not easily captured using today's financial statements. We examine this issue in the next section.

Work Backward to Current Performance

Having completed a forecast for total market size, market share, operating margin, and capital intensity, reconnect the long-term forecast to current performance. To do this, you have to assess the speed of transition from current performance to future long-term performance. Estimates must be consistent with economic principles and industry characteristics. For instance, from the perspective of operating margin, how long will fixed costs dominate variable costs, resulting in low margins? Concerning capital turnover, what scale is required before revenues rise faster than capital? As scale is reached, will competition drive down prices? Often the questions outnumber the answers.

To determine the speed of transition from current performance to target performance, examine the historical progression for similar companies. Unfortunately, analyzing historical financial performance for high-growth companies is often misleading, because long-term investments for high-growth companies tend to be intangible. Under current accounting rules, these investments must be expensed. Therefore, both early accounting profits and invested capital will be understated. With so little formal capital, many companies have unreasonably high ROICs as soon as they become profitable.

Consider Internet retailer Amazon.com. In 2003, the company had an accumulated deficit (the opposite of retained earnings) of $3.0 billion, even though revenues and gross profits (revenues minus direct costs) had grown steadily. How could this occur? Marketing- and technology-related expenses significantly outweighed gross profits. In the years between 1999 and 2003, Amazon.com expensed $742 million in marketing and $1.1 billion in technology development. In 1999, Amazon's marketing expense was 10 percent of revenue. In contrast, Best Buy spends about 2 percent of revenue for advertising. One might argue that the eight-percentage-point differential is more appropriately classified as a brand-building activity, not a short-term revenue driver. Consequently, ROIC overstates the potential return on capital for new entrants because it ignores historically expensed investment.

Develop Scenarios

A simple and straightforward way to deal with uncertainty associated with high-growth companies is to use probability-weighted scenarios. Even developing just a few scenarios makes the critical assumptions and interactions more transparent than other modeling approaches such as real options and Monte Carlo simulation.

To develop probability-weighted scenarios, estimate a future set of financials for a full range of outcomes, some optimistic and some pessimistic.

EXHIBIT 32.10 **Yelp: Key Drivers by Scenario, 2023 Forecast**

	Active accounts	**Total revenues**, $ million	**Operating margin**, %	**Description**
Scenario A	486,182	4,628	26	Growth rates double LinkedIn, and margins match Google
Scenario B	251,740	2,396	26	Growth rates match LinkedIn, and margins match Google
Scenario C	123,870	1,179	14	Growth and margin similar to Monster Worldwide

For Yelp, we have developed three potential scenarios for 2023, summarized in Exhibit 32.10.

In scenario A, we assume Yelp progresses much better than expected. Registrations for free accounts follow the base case (labeled scenario B), but the company doubles its conversion rate from 5 to 10 percent, leading to nearly a half million accounts and approximately $4.6 billion in revenue. In this scenario, the company continues its path to profitability, and margins approach those of Google. Scenario A is an optimistic estimate based on past performance, but a 10 percent conversion rate is by no means implausible.

The next two scenarios follow a similar construct, although certain inputs are varied. In scenario B, our base scenario, revenues grow to almost $2.4 billion on roughly a quarter million converted accounts. Margins once again match Google's. Scenario C assumes that Yelp generates less than $1.2 billion in revenue by 2023 because the international expansion goes poorly. Without expected revenue growth, margins grow to just 14 percent, matching Monster Worldwide's domestic business.

Weight Scenarios

To derive current equity value for Yelp, weight the intrinsic equity valuation from each scenario by its estimated likelihood of occurrence and sum across the weighted scenarios. Exhibit 32.11 lists the intrinsic equity valuations and the probability of occurrence for each scenario. Based on our probability assessments of 30 percent for scenario A, 60 percent for scenario B, and 10 percent

EXHIBIT 32.11 **Yelp: Probability-Weighted Expected Value**

	Intrinsic equity valuation, $ million	×	**Probability**, %	=	**Contribution to equity valuation**, $ million
Scenario A	6,030		30		1,809
Scenario B	3,373		60		2,024
Scenario C	1,276		10		128
			100		3,960
			Shares outstanding, millions		71
			Value per share, $		56

for scenario C, we estimate Yelp's equity value at $3,960 million and value per share at $56. Whether this price is appropriate depends on your belief in the forecasts and their respective probabilities. Were they too optimistic, too pessimistic, or just right?

Scenario probabilities are unobservable and highly subjective. As a result, the final valuation will be quite sensitive to probability weightings. Thus, any set of forecasts built on fundamental economic analysis—such as market size, market share, and competitor margins—should be calibrated against the historical performance of other high-growth companies. Otherwise, assigning too large a weight to an implausible scenario could make the valuation too high (or too low if you are overly conservative).

UNCERTAINTY IS HERE TO STAY

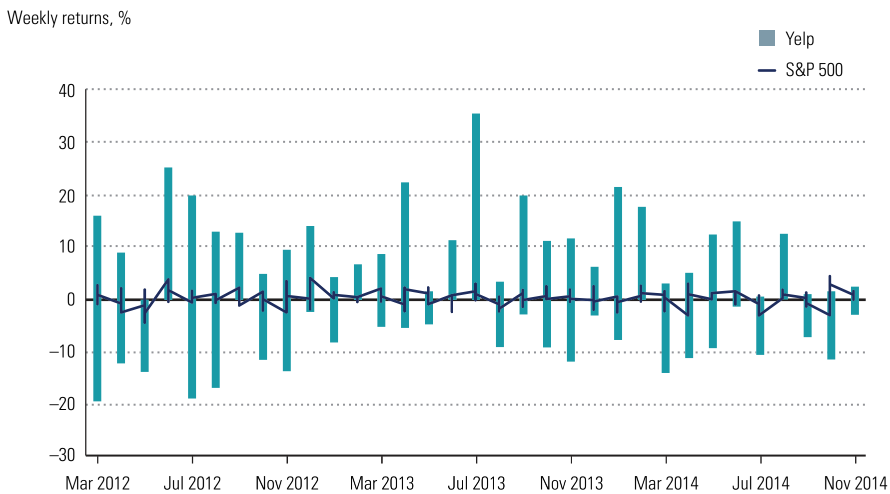
By adapting the DCF approach, it is possible to generate reasonable valuations for dramatically changing businesses. But investors and companies entering fast-growth markets like those related to the Internet should still expect to face huge uncertainties. To see why, look at what could happen under our three scenarios to an investor who holds a share of Yelp stock for five years after buying it in 2013 for $50. To facilitate the calculation, we assume the investor gradually learns about the most likely scenario.

If scenario A plays out, the investor will earn a 19 percent annual return, and as of 2013, the market will seem to have undervalued Yelp. An annual return of 19 percent may not seem very high, but recall that much of Yelp's potential success is already incorporated into the company's stock price. If scenario C plays out, the investment will lose 12 percent a year, and it will appear that the company was overvalued in 2013. Going forward, these high or low potential returns should not be interpreted as implying that the current share price was irrational; they merely reflect uncertainty about the future.

Accurately predicting which scenario will occur is a laudable goal, but achieving it is unlikely. Investors struggle to incorporate new information every day, and this leads to high volatility in the share prices of young companies. Yelp, for instance, had six times the volatility of the S&P 500 during its first two years of trading (see Exhibit 32.12). As Yelp's prospects begin to stabilize, however, it should be possible to tighten the range of potential outcomes. These gains in precision should be reflected in a decrease in the stock's volatility.

A great deal of uncertainty is associated with the problem of identifying the eventual winner in a competitive field. History shows that a few players will win big, while the vast majority will toil away in obscurity. It is difficult to predict which companies will prosper and which will not. Neither investors nor companies can eliminate this uncertainty; that is why advisers tell investors to

EXHIBIT 32.12 **Share Price Volatility for Yelp vs. S&P 500**



Source: Thomson ONE Banker.

diversify their portfolios, and why companies do not pay cash when acquiring young, high-growth firms.

SUMMARY

The emergence of the Internet and related technologies created impressive value for some high-growth enterprises at the end of the twentieth century. It also raised questions about the sanity of a stock market that appeared to assign higher value to companies the more their losses mounted. But as this chapter demonstrates, the DCF approach remains an essential tool for understanding the value of high-growth companies. You must adapt your approach when valuing these companies: start from the future rather than the present when making your forecast, think in terms of scenarios, and compare the economics of the business model with peers. Though you cannot reduce the volatility of these companies, at least you can understand it.

33

Cyclical Companies

A cyclical company is one whose earnings demonstrate a repeating pattern of significant increases and decreases. The earnings of cyclical companies, including those in the steel, airline, paper, and chemical industries, fluctuate because the prices of their products change dramatically as demand for them varies and as the companies themselves at times create too much capacity. Volatile earnings within the cycle introduce additional complexity into the valuation of these cyclical companies. For example, historical performance must be assessed in the context of the cycle. A decline in recent performance does not necessarily indicate a long-term negative trend, but rather a shift to a different part of the cycle.

This chapter explores the valuation issues particular to cyclical companies. It starts with an examination of how the share prices of cyclical companies behave. This leads to a suggested approach for valuing these companies, as well as possible implications for managers.

SHARE PRICE BEHAVIOR

Suppose you were using the discounted-cash-flow (DCF) approach to value a cyclical company and had perfect foresight about the industry cycle. Would the company's value and earnings behave similarly? No. A succession of DCF values would exhibit much lower volatility than the earnings or cash flows. DCF reduces future expected cash flows to a single value. As a result, any single year is unimportant. For a cyclical company, the high cash flows cancel out the low cash flows. Only the long-term trend really matters.

To illustrate, the business cycle of Company A is 10 years. Exhibit 33.1, part 1, shows the company's hypothetical cash flow pattern. It is highly volatile, containing both positive and negative cash flows. Discounting the future free cash flows at 10 percent produces the succession of DCF values in part 2 of the exhibit. Part 3 compares the cash flows and the perfect foresight DCF

EXHIBIT 33.1 **The Long-Term View: Free Cash Flow and DCF Volatility**

Free cash flow pattern, Company A, $ million

1

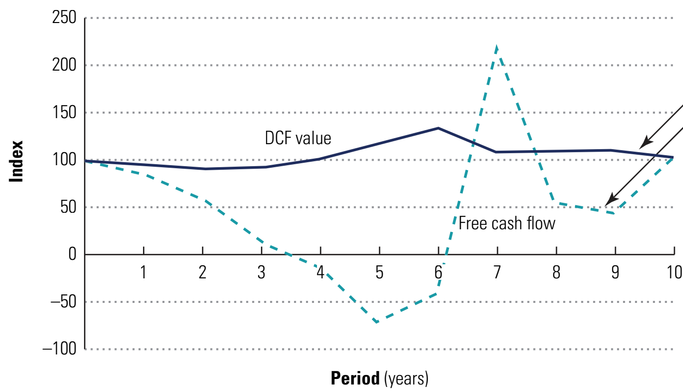
	Period (years)										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
After-tax operating profit	10	9	6	3	–	(2)	3	18	7	6	10
Net investment	3	3	2	2	1	3	5	3	3	3	3
Free cash flow	7	6	4	1	(1)	(5)	(3)	15	4	3	7

Cash flows valued from any one year forward

2

DCF value	34	33	27	28	30	35	40	33	33	34	31

3 Free cash flow and DCF value patterns



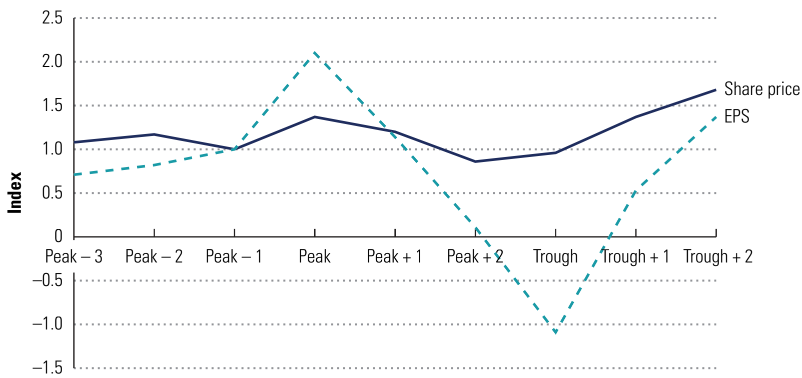
values (the values are indexed for comparability). It shows that the DCF value is far less volatile than the underlying cash flow, because no single year's performance has a significant impact on the value of the company.

In the real world, the share prices of cyclical companies are less stable than the example in exhibit 33.1. Exhibit 33.2 shows the earnings per share (EPS) and share prices, both indexed, for 15 companies with a four-year cycle. The share prices are more volatile than the DCF approach would predict—suggesting that market prices exhibit the bias of anchoring on current earnings.

How can this apparent anomaly be explained? We examined equity analysts' consensus earnings forecasts for cyclical companies to see if they would provide any clues to the volatile stock prices of these companies. What we found surprised us. Consensus earnings forecasts for cyclical companies appeared to ignore cyclicality entirely. The forecasts invariably showed an upward-sloping trend, whether the companies were at the peak or trough of the cycle.

What became apparent was not that the DCF model was inconsistent with the facts, but that the market's projections of earnings and cash flow (assuming the market followed the analysts' consensus) were to blame. This conclusion

EXHIBIT 33.2 **Share Prices and EPS: 15 Cyclical Companies**



was based on an analysis of 36 U.S. cyclical companies during 1985 to 1997. We divided them into groups with similar cycles (e.g., three, four, or five years from peak to trough) and calculated scaled average earnings and earnings forecasts. We then compared actual earnings with consensus earnings forecasts over the cycle.[1]

Exhibit 33.3 plots the actual earnings and consensus earnings forecasts for the set of 15 companies with four-year cycles in primary metals and manufacturing transportation equipment. The consensus forecasts do not predict the earnings cycle at all. In fact, except for the next-year forecasts in the years following the trough, the earnings per share are forecast to follow an upward-sloping path with no future variation.[2]

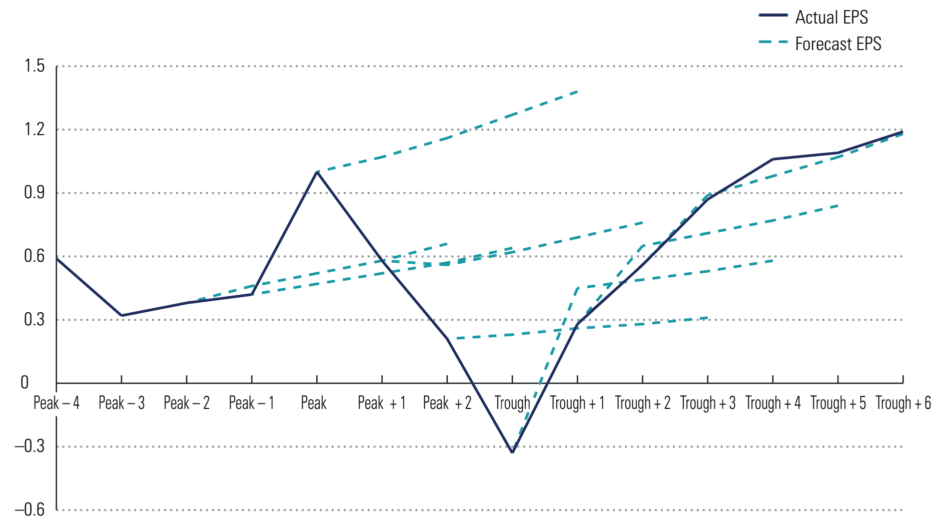
One explanation could be that equity analysts have incentives to avoid predicting the earnings cycle, particularly the down part. Academic research has shown that earnings forecasts have a positive bias that is sometimes attributed to the incentives facing equity analysts at investment banks.[3] Pessimistic earnings forecasts may damage relations between an analyst's employer—an investment bank—and a particular company. In addition, companies that are the target of negative commentary might cut off an analyst's access to management. From this evidence, we could conclude that analysts as a group are

[1]Note that we have already adjusted downward the normal positive bias of analyst forecasts to focus on just the cyclicality issue. V. K. Chopra, "Why So Much Error in Analysts' Earnings Forecasts?" *Financial Analysts Journal* (November/December 1998): 35–42.

[2]Similar results were found for companies with three- and five-year cycles.

[3]The following articles discuss this hypothesis: M. R. Clayman and R. A. Schwartz, "Falling in Love Again—Analysts' Estimates and Reality," *Financial Analysts Journal* (September/October 1994): 66–68; J. Francis and D. Philbrick, "Analysts' Decisions as Products of a Multi-Task Environment," *Journal of Accounting Research* 31, no. 2 (Autumn 1993): 216–230; K. Schipper, "Commentary on Analysts' Forecasts," *Accounting Horizons* (December 1991): 105–121; B. Trueman, "On the Incentives for Security Analysts to Revise Their Earnings Forecasts," *Contemporary Accounting Research* 7, no. 1 (1990): 203–222.

EXHIBIT 33.3 **Actual EPS and Consensus EPS Forecasts: 15 Cyclical Companies**

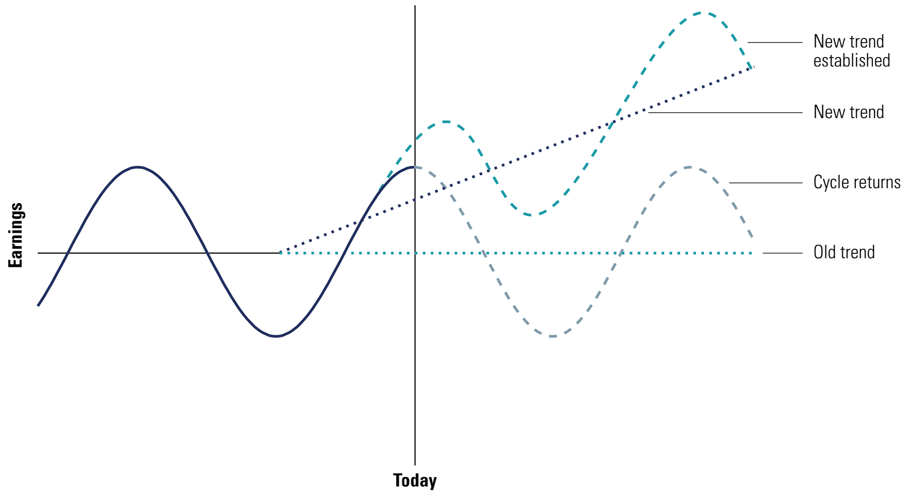


unable or unwilling to predict the cycles for these companies. If the market followed analyst forecasts, that behavior could account for the high volatility of cyclical companies' share prices.

We know that it is difficult to predict cycles, particularly their inflection points. So it is not surprising that the market does not get it exactly right. However, we would be surprised if the stock market entirely missed the cycle, as the analysis of consensus forecasts suggests. To address this issue, we returned to the question of how the market should behave. Should it be able to predict the cycle and therefore exhibit little share price volatility? That would probably be asking too much. At any point, the company or industry could break out of its cycle and move to one that is higher or lower, as illustrated in Exhibit 33.4.

Suppose you are valuing a company that seems to be at a peak in its earnings cycle. You will never have perfect foresight of the market cycle. Based on past cycles, you expect the industry to turn down soon. However, there are signs that the industry is about to break out of the old cycle. A reasonable valuation approach, therefore, would be to build two scenarios and weight their values. Suppose you assumed, with a 50 percent probability, that the cycle will follow the past and that the industry will turn down in the next year or so. The second scenario, also with 50 percent probability, would be that the industry will break out of the cycle and follow a new long-term trend based on current improved performance. The value of the company would then be the weighted average of these two values.

EXHIBIT 33.4 **When the Cycle Changes**



We found evidence that this is, in fact, the way the market behaves. We valued the four-year cyclical companies three ways:

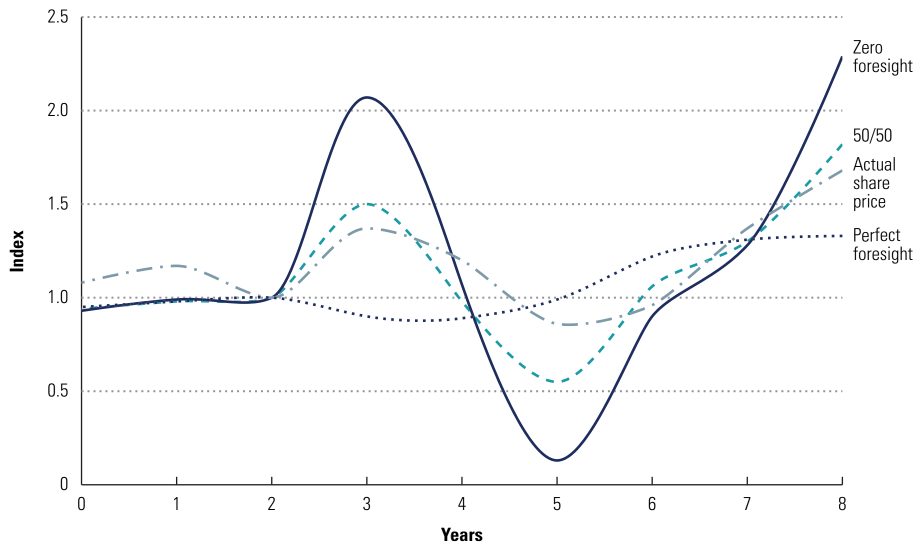
1. With perfect foresight about the upcoming cycle
2. With zero foresight, assuming that current performance represents a point on a new long-term trend (essentially the consensus earnings forecast)
3. With a 50/50 forecast: 50 percent perfect foresight and 50 percent zero foresight

Exhibit 33.5 summarizes the results, comparing them with actual share prices. As shown, the market does not follow either the perfect-foresight or the zero-foresight path; it follows a blended path, much closer to the 50/50 path. So the market has neither perfect foresight nor zero foresight. One could argue that this 50/50 valuation is the right place for the market to be.

AN APPROACH TO VALUING CYCLICAL COMPANIES

No one can precisely predict the earnings cycle for an industry, and any single forecast of performance must be wrong. Managers and investors can benefit from following explicitly the multiple-scenario probabilistic approach to valuing cyclical companies, similar to the approach used in Chapter 15 and the high-growth-company valuation in Chapter 32. The probabilistic approach

EXHIBIT 33.5 **Market Values of Cyclical Companies: Forecasts with Three Levels of Foresight**



avoids the traps of a single forecast and allows exploration of a wider range of outcomes and their implications.

Here is a two-scenario approach for valuing cyclical companies in four steps (of course, you could always have more than two scenarios):

1. Construct and value the normal cycle scenario, using information about past cycles. Pay particular attention to the long-term trend lines of operating profits, cash flow, and ROIC, because they will have the largest impact on the valuation. Make sure the continuing value is based on a normalized level of profits (i.e., a point on the company's long-term cash flow trend line), not a peak or trough.
2. Construct and value a new trend line scenario based on the company's recent performance. Once again, focus primarily on the long-term trend line, because it will have the largest impact on value. Do not worry too much about modeling future cyclicality (although future cyclicality will be important for financial solvency).
3. Develop the economic rationale for each of the two scenarios, considering factors such as demand growth, companies entering or exiting the industry, and technology changes that will affect the balance of supply and demand.

4. Assign probabilities to the scenarios, and calculate their weighted values. Use the economic rationale and its likelihood to estimate the weights assigned to each scenario.

This approach provides an estimate of the value as well as scenarios that put boundaries on the valuation. Managers can use these boundaries to improve their strategy and respond to signals about which scenario is likely to occur.

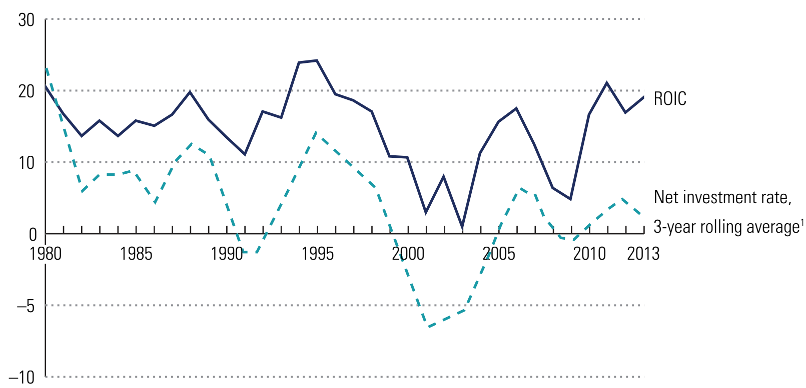
IMPLICATIONS FOR MANAGING CYCLICAL COMPANIES

Is there anything managers can do to reduce or take advantage of the cyclicality of their industry? Evidence suggests that, in many cyclical industries, the companies themselves are what drive cyclicality. Exhibit 33.6 shows the ROIC and net investment in commodity chemicals from 1980 to 2013. The chart shows that, collectively, commodity chemical companies invest large amounts when prices and returns are high. Since capacity comes on line in very large chunks, however, utilization plunges, and this places downward pressure on price and ROIC. The cyclical investment in capacity is the driver of the cyclical profitability. Fluctuations in demand from customers do not cause cyclicality in profits. Producer supply does.

Managers who have detailed information about their product markets should be able to do a better job than the financial market in figuring out the cycle and then take appropriate actions. We can only speculate why they do not do so. Still, based on conversations with these executives, we believe that the herding behavior is caused by three factors: First, it is easier to invest when prices are high, because that is when cash is available. Second, it is easier to get

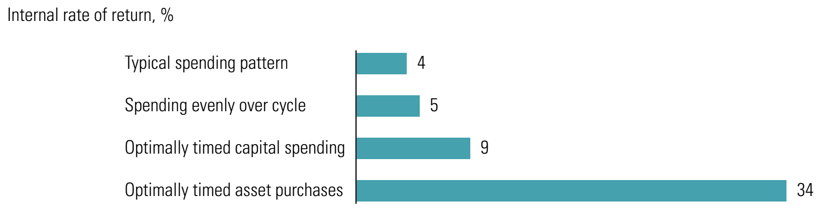
EXHIBIT 33.6 **ROIC and Investment Rate: Commodity Chemicals, 1980–2013**

Median of North American companies, %



[1] Change in net property, plant, and equipment adjusted for inflation.

EXHIBIT 33.7 **Relative Returns from Capital Expenditure Timing**



approval from boards of directors to invest when profits are high. Finally, executives are concerned about their rivals growing faster than themselves (investments are a way to maintain market share).

This behavior also sends confusing signals to the stock market. Expanding when prices are high tells the financial market that the future looks great (often just before the cycle turns down). Signaling pessimism just before an upturn also confuses the market. Perhaps it should be no surprise that the stock market has difficulty valuing cyclical companies.

How could managers exploit their superior knowledge of the cycle? The most obvious action would be to improve the timing of capital spending. Companies could also pursue financial strategies, such as issuing shares at the peak of the cycle or repurchasing shares at the cycle's trough. The most aggressive managers could take this one step further by adopting a trading approach, making acquisitions at the bottom of the cycle and selling assets at the top. Exhibit 33.7 shows the results of a simulation of optimal cycle timing. The typical company's returns on investment could increase substantially.

Can companies really behave this way and invest against the cycle? It is actually very difficult for a company to take the contrarian view. The CEO must convince the board and the company's bankers to expand when the industry outlook is gloomy and competitors are retrenching. In addition, the CEO has to hold back while competitors build at the top of the cycle. Breaking out of the cycle may be possible, but it is the rare CEO who can do it.

SUMMARY

At first glance, the share prices of cyclical companies appear too volatile to be consistent with the DCF valuation approach. This chapter shows, however, that share price volatility can be explained by the uncertainty surrounding the industry cycle. Using scenarios and probabilities, managers and investors can take a systematic DCF approach to valuing and analyzing cyclical companies.

34

Banks

Banks are among the most complex businesses to value, especially from the outside in. Published accounts give an overview of a bank's performance, but the clarity of the picture they present depends largely on accounting decisions made by management. External analysts must therefore make a judgment about the appropriateness of those decisions. Even if that judgment is favorable, analysts are still bound to lack vital information about the bank's economics, such as the extent of its credit losses or any mismatch between its assets and liabilities, forcing them to fall back on rough estimates for their valuation. Moreover, banks are highly levered, making bank valuations even more contingent on changing economic circumstances than valuations in other sectors. Finally, most banks are in fact multibusiness companies, requiring separate analysis and valuation of their key business segments. So-called universal banks today engage in a wide range of businesses, including retail and wholesale banking, investment banking, and asset management.

In the view of some academics, managers, and regulators, the size, complexity, and lack of transparency of universal banks in the United States and Europe has led to undesirable systemic risks, among them that some banks have become "too big to fail."[1] During the 2008 credit crisis, the threat of collapse by some large universal banks led governments to bail out these institutions, triggering an ongoing debate about whether such institutions should be split into smaller and separate investment and commercial banks.[2]

This chapter provides a general overview of how to value banks, and highlights some of the most common valuation challenges peculiar to the

[1]See, for example, "Universal Banking: Together, Forever?" *The Economist*, August 12, 2012.

[2]For recent analyses of the costs and benefits of large universal banks, see International Monetary Fund, "Global Financial Stability Report 2014," April 2014; and U.S. Government Accountability Office, "Large Bank Holding Companies: Expectations of Government Support," July 2014.

sector. First it discusses the economic fundamentals of banking and trends in performance and growth, and then describes how to use the equity cash flow approach for valuing banks, using a hypothetical, simplified example. It concludes by offering some practical recommendations for valuing universal banks in all their real-world complexity.

ECONOMICS OF BANKING

After years of strong profitability and growth in the U.S. and European banking sectors, the crisis in the mortgage-backed securities market in 2007 sent many large banks spiraling into financial distress. Many large institutions on either side of the Atlantic went bankrupt or were kept afloat with costly government bailouts. The fallout in the real economy from what was originally a crisis in the banking sector ultimately curtailed growth in almost all sectors around the globe, bringing economic growth to a halt worldwide in 2008.

Since then, the sector has gone through years of restructuring, involving mergers, government bailouts, nationalizations, and bankruptcies. Regulation has intensified, leading to stricter capital requirements, restrictions on trading operations, and—in some European countries—caps on bonus payments for bank employees and executives. By 2014, banks in the United States had ridden stronger domestic economic growth, rebounding loan demand, and a reduction in bad debts to regain their pre-crisis profit levels. In contrast, European banks were still far below their pre-crisis profit levels due to a lack of economic growth across the European Union and the 2010 euro sovereign-debt crisis.

The credit crisis demonstrates the extent to which the banking industry is both a critical and a vulnerable component of modern economies. Banks are vulnerable because they are highly leveraged and their funding depends on investor and customer confidence. This can disappear overnight, sending a bank plummeting into failure. As a result, more uncertainty surrounds the valuation of banks than the valuation of most industrial companies. Therefore, it is all the more important for anyone valuing a bank to understand the business activities undertaken by banks, the ways in which banks create value, and the drivers of that value creation.

Universal banks may engage in any or all of a wide variety of business activities, including lending and borrowing, underwriting and placement of securities, payment services, asset management, proprietary trading, and brokerage. For the purpose of financial analysis and valuation, we group these activities according to the three types of income they generate for a bank: net interest income, fee and commission income, and trading income. "Other income" forms a fourth and generally smaller residual category of income from activities unrelated to the main banking businesses.

Net Interest Income

In their traditional role, banks act as intermediaries between parties with funding surpluses and those with deficits. They attract funds in the form of customer deposits and debt to provide funds to customers in the form of loans such as mortgages, credit card loans, and corporate loans. The difference between the interest income a bank earns from lending and the interest expense it pays to borrow funds is its net interest income. For the regional retail banks in the United States and retail-focused universal banks such as Standard Chartered, Banco Santander, and Unicredit, net interest income typically forms around half of total net revenues.

As discussed later in this chapter, it is important to understand that not all of a bank's net interest income creates value. Most banks have a maturity mismatch as a result of using short-term deposits as funding to back long-term loans and mortgages. In this case, the bank earns income from being on different parts of the yield curve. Typically, borrowing for the short term costs less than what the bank can earn from long-term lending. Yet it is unclear whether all of this income represents value creation. For example, the true value created from lending is measured by the difference between the rate that banks receive on their outstanding loans and their returns in the financial markets on loans with the same maturity (see the section on economic-spread analysis later in this chapter).

Fee and Commission Income

For services such as transaction advisory, underwriting and placement of securities, managing investment assets, securities brokerage, and many others, banks typically charge their customers a fee or commission. For investment banks (such as Morgan Stanley) and for universal banks with large investment banking activities (among them HSBC, Bank of America, and Deutsche Bank), commission and fee income makes up around half of total net revenues. Fee income is usually easier to understand than net interest income, as it is independent of financing. However, some forms of fee income are highly cyclical; examples include fees from underwriting and transaction advisory services.

Trading Income

Over the past 30 years, proprietary trading emerged as a third main category of income for the banking sector as a whole. This can involve not only a wide variety of instruments traded on exchanges and over the counter, such as equity stocks, bonds, and foreign exchange, but also more exotic products, such as credit default swaps and asset-backed debt obligations, traded mostly over the counter.

Trading profits tend to be highly volatile: gains made over several years may be wiped out by large losses in a single year, as the credit crisis painfully illustrated. These activities have also attracted considerable attention in the wake of the crisis. In 2010, the United States adopted legislation preventing banks from engaging in proprietary trading for their own profit.[3] This resulted in steeply lower overall trading income, as the law permits only trading related to serving the bank's customers. Similar restrictions were adopted in Europe, and though they have not yet been enforced there, trading income for European banks has sharply declined since 2008.

Other Income

Some banks also generate income from a range of nonbanking activities, including real estate development, minority investments in industrial companies, and distribution of investment, insurance, and pension products and services for third parties. Typically, these activities make only small contributions to overall income and are unrelated to the bank's main banking activities.

As Exhibit 34.1 shows for the European banking sector, the relative importance of these four income sources has changed radically over past decades. European banks have steadily shifted away from interest income toward commission and trading income. However, trading income collapsed during the credit crisis. Despite recovering somewhat since then, in 2014 it was still running far below its pre-crisis levels.

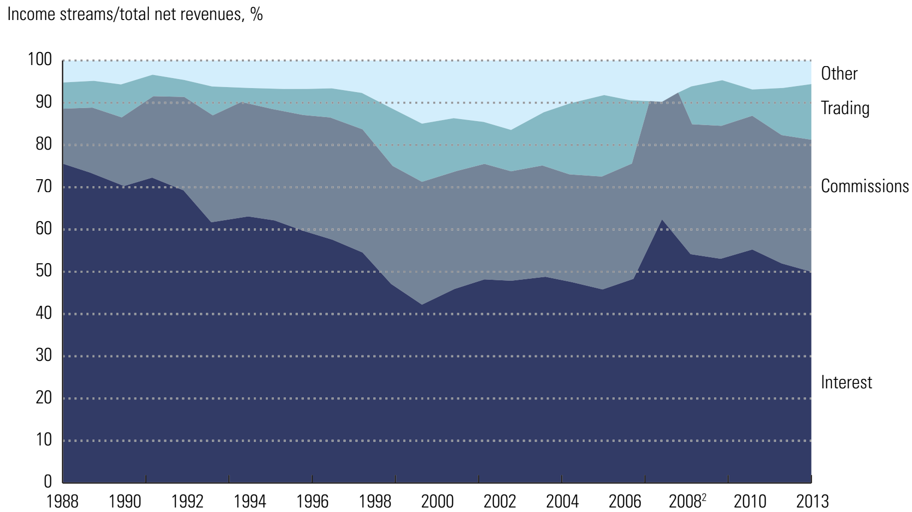
As the banks have shifted their sources of income, the cyclicality of their profitability and market valuations has increased. This is measured by their return on equity and their market-to-book ratios (see Exhibit 34.2). The return on equity and market-to-book ratios for the sector as a whole in both the United States and Europe rose sharply after 1995 to reach historic peaks in 2006. But they fell sharply during the credit crisis, with European banks suffering a second decline during the 2010 euro bond crisis. In 2014, profitability and valuation levels remained far below their peak levels on both sides of the Atlantic, though American banks were much more successful than their European counterparts in regaining some ground.

PRINCIPLES OF BANK VALUATION

Throughout most of this book, we apply the enterprise discounted-cash-flow (DCF) approach to valuation. Discounting free cash flows is the appropriate approach for nonfinancial companies where operating decisions and financing

[3]The 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act aims to improve the stability of the U.S. financial system through increased regulation and supervision. For example, it established restrictions on proprietary trading by banks through the so-called Volcker Rule and new government agencies such as the Financial Stability Oversight Council.

EXHIBIT 34.1 **Income Sources for European Banks, 1988–2013**[1]



[1] For 1988–2007, based on aggregate financials and valuation of 113 EU banks, of which 109 were active in 2007. For 2008–2013, based on a sample of 211 active EU banks in 2013.
[2] Trading income was –9% in 2008.
Source: Bloomberg, Compustat, Datastream.

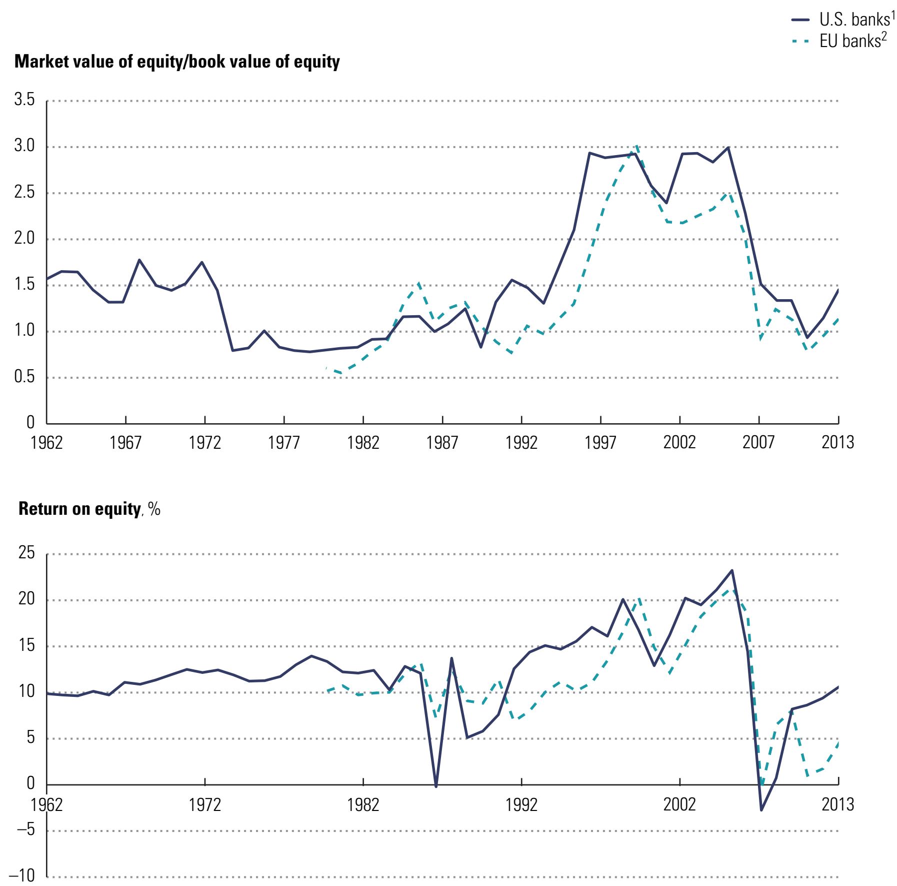
decisions are separate. For banks, however, we cannot value operations separately from interest income and expense, since these are the main categories of a bank's core operations. It is necessary to value the cash flow to equity, which includes both the operational and financial cash flows. For valuation of banks, we therefore recommend the equity DCF method.[4] To understand the principles of the equity DCF method, let's explore a stylized example of a retail bank. ABC Bank attracts customer deposits to provide funds for loans and mortgages to other customers. ABC's historical balance sheet, income statement, and key financial indicators are shown in Exhibit 34.3.

At of the start of 2014, the bank has $1,134 million of loans outstanding with customers, generating 6.5 percent interest income. To meet regulatory requirements, ABC must maintain an 8 percent ratio of Tier 1 equity capital to loan assets, which we define for this example as the ratio of equity divided by total assets. This means that 8 percent, or $91 million, of its loans are funded by equity capital, and the rest of the loans are funded by $1,043 million of deposits. The deposits carry 4.3 percent interest, generating total interest expenses of $45 million.

Net interest income for ABC amounted to $29 million in 2014, thanks to the higher rates received on loans than paid on deposits. All capital gains or losses on loans and deposits are included in interest income and expenses.

[4]See Chapter 8 for a comparison of the enterprise and equity DCF methods.

EXHIBIT 34.2 **Increased Cyclicality in Banking**



[1] U.S. banks: For 1962–2007, based on aggregate financials and valuation of 957 U.S. banks, of which 346 were active in 2007. For 2008–2013, based on a sample of 509 active U.S. banks in 2013. Book value excludes goodwill.
[2] EU banks: For 1980–2007, based on aggregate financials and valuation of 113 EU banks, of which 109 were active in 2007. For 2008–2013, based on a sample of 211 active EU banks in 2013. Book value excludes goodwill.

Source: Bloomberg, Compustat, Datastream.

Operating expenses such as labor and rental costs are \$13 million, which brings ABC's cost-to-income ratio to 45 percent of net interest income. After subtracting taxes at 30 percent, net income equals \$11 million, which translates into a return on equity of 12.2 percent.

As discussed in Chapter 8, the equity value of a company equals the present value of its future cash flow to equity (CFE), discounted at the cost of equity, k_e:

$$V_e = \sum_{t=1}^{\infty} \frac{\text{CFE}_t}{(1 + k_e)^t}$$

EXHIBIT 34.3 **ABC Bank: Historical Financial Statements**

$ million

	2010	2011	2012	2013	2014
Balance sheet[1]					
Loans	1,030.0	1,063.5	1,097.5	1,133.7	1,173.4
Total assets	1,030.0	1,063.5	1,097.5	1,133.7	1,173.4
Deposits	988.8	999.7	1,009.7	1,043.0	1,079.5
Equity	41.2	63.8	87.8	90.7	93.9
Total liabilities	1,030.0	1,063.5	1,097.5	1,133.7	1,173.4
Income statement					
Interest income	70.0	72.1	74.4	71.3	73.7
Interest expense	(48.0)	(47.5)	(47.0)	(45.4)	(44.9)
Net interest income	22.0	24.6	27.5	25.9	28.8
Operating expenses	(11.2)	(13.1)	(14.3)	(12.2)	(13.0)
Operating profit before taxes	10.8	11.6	13.2	13.7	15.9
Income taxes	(3.2)	(3.5)	(4.0)	(4.1)	(4.8)
Net income	7.5	8.1	9.2	9.6	11.1
Key ratios, %					
Loan growth	3.0	3.3	3.2	3.3	3.5
Loan interest rate	7.0	7.0	7.0	6.5	6.5
Deposit growth	3.0	1.1	1.0	3.3	3.5
Deposit interest rate	5.0	4.8	4.7	4.5	4.3
Cost/income	51.0	53.0	52.0	47.0	45.0
Tax rate	30.0	30.0	30.0	30.0	30.0
Equity/total assets	4.0	6.0	8.0	8.0	8.0
Return on equity[2]	18.9	19.7	14.5	10.9	12.2

[1] Book value per end of year.
[2] Return on beginning-of-year equity.

We can derive equity cash flow from two starting points. First, equity cash flow equals net income minus the earnings retained in the business:

$$\text{CFE}_t = \text{NI}_t - \Delta E_t + \text{OCI}_t$$

where CFE is equity cash flow, NI is net income, ΔE is the increase in the book value of equity, and OCI is noncash other comprehensive income.

Net income represents the earnings theoretically available to shareholders after payment of all expenses, including those to depositors and debt holders. However, net income by itself is not cash flow. As a bank grows, it will need to increase its equity; otherwise, its ratio of debt plus deposits over equity would rise, which might cause regulators and customers to worry about the bank's solvency. Increases in equity reduce equity cash flow, because they mean the

EXHIBIT 34.4 **ABC Bank: Historical Cash Flow to Equity**

$ million

	2010	2011	2012	2013	2014
Cash flow statement					
Net income	7.5	8.1	9.2	9.6	11.1
(Increase) decrease in equity	(1.2)	(22.6)	(24.0)	(2.9)	(3.2)
Other comprehensive income (loss)	0.2	–	–	–	–
Cash flow to equity	6.5	(14.5)	(14.8)	6.7	7.9

bank is issuing more shares or setting aside earnings that could otherwise be paid out to shareholders. The last step in calculating equity cash flow is to add noncash other comprehensive income, such as net unrealized gains and losses on certain equity and debt investments, hedging activities, adjustments to the minimum pension liability, and foreign-currency translation items. This cancels out any noncash adjustment to equity.[5]

Exhibit 34.4 shows the equity cash flow calculation for ABC Bank. Note that in 2010, ABC's other comprehensive income includes a translation gain on its overseas loan business, which was discontinued in the same year. ABC's cash flow to equity was negative in 2011 and 2012 because it raised new equity to lift its Tier 1 ratio from 4 percent to 8 percent.

Another way to calculate equity cash flow is to sum all cash paid to or received from shareholders, including cash changing hands as dividends, through share repurchases, and through new share issuances. Both calculations arrive at the same result. Note that equity cash flow is not the same as dividends paid out to shareholders, because share buybacks and issuance can also form a significant part of cash flow to and from equity.

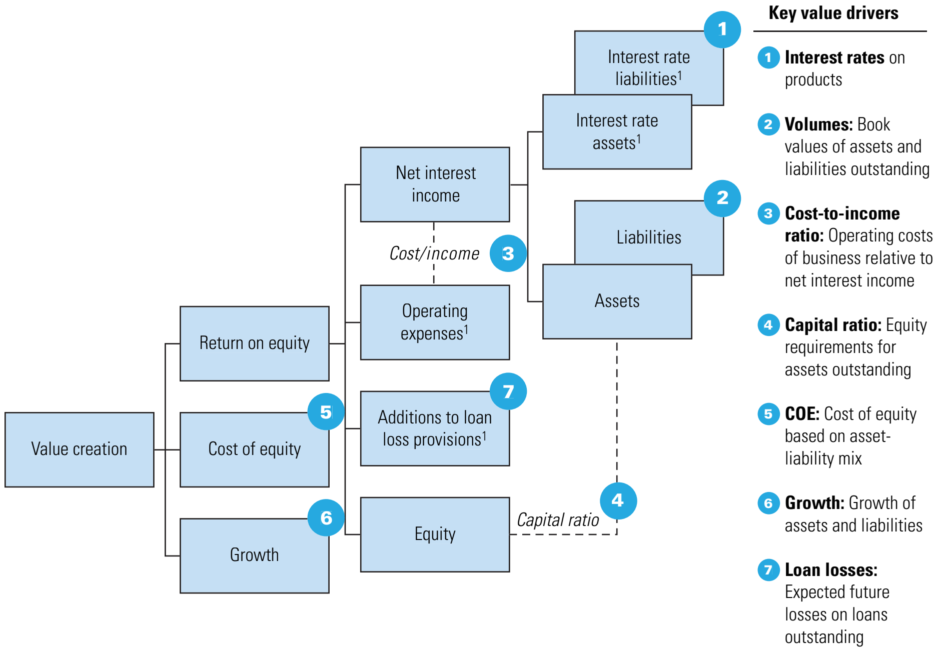
Analyzing and Forecasting Equity Cash Flows

The generic value driver tree for a retail bank, shown in Exhibit 34.5, is conceptually the same as one for an industrial company. Following the tree's branches, we analyze ABC's historical performance as laid out in Exhibit 34.3.

Over the past five years, ABC's loan portfolio has grown by around 3.0 to 3.5 percent annually. Since 2010, ABC's interest rates on loans have been declining from 7.0 percent to 6.5 percent in 2014, but this was offset by an even stronger decrease in rates on deposits from 5.0 percent to 4.3 percent over the same period. Combined with the growth in its loan portfolio, this lifted ABC's

[5] Of course, you can also calculate equity cash flow from the changes in all the balance sheet accounts. For example, equity cash flow for a bank equals net income plus the increase in deposits and reserves, less the increase in loans and investments, and so on.

EXHIBIT 34.5 **Generic Value Driver Tree for Retail Banking: Equity DCF Version**



[1] After taxes.

net interest income from $22 million in 2010 to $29 million in 2014. The bank also managed to improve its cost-to-income ratio significantly from a peak level of 53 percent in 2011 to 45 percent in 2014.

Higher regulatory requirements for equity risk capital forced ABC to double its Tier 1 ratio (equity to total assets) from 4 percent to 8 percent over the period. The combination of loan portfolio growth and stricter regulatory requirements has forced ABC to increase its equity capital by some $50 million since 2009. As a result, ABC's return on equity declined significantly in 2014 to 12 percent, from nearly 20 percent in 2011.

Exhibit 34.6 shows the financial forecasts for ABC Bank, assuming its loan portfolio growth rate increases to 4.5 percent in the short term and settles at 3.5 percent in perpetuity. Interest rates on loans and deposits are expected to decrease to 6.1 and 3.9 percent, respectively. Operating expenses will decline to 43 percent of net interest income. As a result, ABC's return on equity increases somewhat to 12.8 percent in 2016 and stays at that level in perpetuity. Note that a mere one-percentage-point increase in interest rates on loans would translate into a change in return on equity of around 12 percentage points, a function of ABC's high leverage (equity capital at 8 percent of total assets).

EXHIBIT 34.6 **ABC Bank: Financial Forecasts**

$ million

	2015	2016	2017	2018	2019	2020
Balance sheet[1]						
Loans	1,226.2	1,281.4	1,332.6	1,379.3	1,427.6	1,477.5
Total assets	1,226.2	1,281.4	1,332.6	1,379.3	1,427.6	1,477.5
Deposits	1,128.1	1,178.9	1,226.0	1,268.9	1,313.4	1,359.3
Equity	98.1	102.5	106.6	110.3	114.2	118.2
Total liabilities	1,226.2	1,281.4	1,332.6	1,379.3	1,427.6	1,477.5
Income statement						
Interest income	71.6	74.8	78.2	81.3	84.1	87.1
Interest expense	(41.6)	(43.4)	(45.4)	(47.2)	(48.9)	(50.6)
Net interest income	30.0	31.4	32.8	34.1	35.3	36.5
Operating expense	(13.5)	(13.5)	(14.1)	(14.7)	(15.2)	(15.7)
Operating profit before tax	16.5	17.9	18.7	19.4	20.1	20.8
Income taxes	(5.0)	(5.4)	(5.6)	(5.8)	(6.0)	(6.2)
Net income	11.6	12.5	13.1	13.6	14.1	14.6
Cash flow statement						
Net income	11.6	12.5	13.1	13.6	14.1	14.6
(Increase) decrease in equity	(4.2)	(4.4)	(4.1)	(3.7)	(3.9)	(4.0)
Other comprehensive (income) loss	–	–	–	–	–	–
Cash flow to equity	7.3	8.1	9.0	9.9	10.2	10.6
Key ratios, %						
Loan growth	4.5	4.5	4.0	3.5	3.5	3.5
Loan interest rate	6.1	6.1	6.1	6.1	6.1	6.1
Deposit growth	4.5	4.5	4.0	3.5	3.5	3.5
Deposit interest rate	3.9	3.9	3.9	3.9	3.9	3.9
Cost/income	45.0	43.0	43.0	43.0	43.0	43.0
Tax rate	30.0	30.0	30.0	30.0	30.0	30.0
Equity/total assets	8.0	8.0	8.0	8.0	8.0	8.0
Return on equity[2]	12.3	12.8	12.8	12.8	12.8	12.8

[1] Book value per end of year.
[2] Return on beginning-of-year equity.

Discounting Equity Cash Flows

To estimate the cost of equity, k_e, for ABC Bank, we use a beta of 1.3 (based on the average beta for its retail banking peers), a long-term risk-free interest rate of 4.5 percent, and a market risk premium of 5 percent:[6]

$$k_e = r_f + \beta \times \text{MRP} = 4.5\% + 1.3 \times 5.0\% = 10.9\%$$

[6] See Chapter 13 for more details on estimating the cost of capital.

where r_f is the risk-free rate, β is the equity beta, and MRP is the market risk premium. (Because we discount at the cost of equity, there is no need to adjust any estimates of equity betas of banking peers for leverage when deriving ABC's equity beta.)

In the equity DCF approach, we use an adapted version of the value driver formula presented in Chapter 2, replacing return on invested capital (ROIC) and return on new invested capital (RONIC) with return on equity (ROE) and return on new equity investments (RONE), and replacing net operating profit less adjusted taxes (NOPLAT) with net income:

$$\text{CV}_t = \frac{\text{NI}_{t+1}\left(1 - \frac{g}{\text{RONE}}\right)}{k_e - g}$$

where CV_t is the continuing value as of year t, NI_{t+1} is the net income in year $t + 1$, g equals growth, and k_e is the cost of equity.

Assuming that ABC Bank continues to generate a 12.8 percent ROE on its new business investments in perpetuity while growing at 3.5 percent per year,[7] its continuing value as of 2020 is as follows:

$$\text{CV} = \frac{\$15.1\text{ million}\left(1 - \frac{3.5\%}{12.8\%}\right)}{10.9\% - 3.5\%} = \$148.9\text{ million}$$

The calculation of the discounted value of ABC's cash flow to equity is presented in Exhibit 34.7. The present value of ABC's equity amounts to \$118 million, which implies a market-to-book ratio for its equity of 1.3 and a price-to-earnings (P/E) ratio of 10.2. As for industrial companies, whenever possible you should triangulate your results with an analysis based on multiples (see Chapter 16). Note that the market-to-book ratio indicates that ABC is creating value over its book value of equity, which is consistent with a long-term return on equity of 12.8 percent (which is above the cost of equity of 10.9 percent).

Pitfalls of Equity DCF Valuation

The equity DCF approach as illustrated here is straightforward and theoretically correct. However, the approach involves some potential pitfalls. These

[7] If the return on new equity investments (RONE) equals the return on equity (ROE), the formula can be simplified as follows:

$$\text{CV}_t = \frac{\text{NI}_{t+1}\left(1 - \frac{g}{\text{ROE}}\right)}{k_e - g} = E_t\left(\frac{\text{ROE} - g}{k_e - g}\right)$$

where E is the book value of equity.

EXHIBIT 34.7 **ABC Bank: Valuation**

$ million

	Cash flow to equity (CFE)	Discount factor	Present value of CFE
2015	7.3	0.902	6.6
2016	8.1	0.814	6.6
2017	9.0	0.734	6.6
2018	9.9	0.662	6.5
2019	10.2	0.597	6.1
2020	10.6	0.539	5.7
Continuing value	148.9	0.539	80.2
Value of equity			118.4
Market-to-book ratio			1.3
P/E[1]			10.2

[1] Forward price-to-earnings ratio on 2015 net income.

concern the sources of value creation, the impact of leverage and business risk on the cost of equity, and the tax penalty on holding equity risk capital.

Sources of value creation The equity DCF approach does not tell us how and where ABC Bank creates value in its operations. Is ABC creating or destroying value when receiving 6.5 percent interest on its loans or when paying 4.3 percent on deposits? To what extent does ABC's net income reflect intrinsic value creation?

You can overcome this pitfall by undertaking economic-spread analysis, described in the next section. As that section will show, ABC is creating value in its lending business but much less so in deposits, which were not creating any value before 2014 in this particular example. A significant part of ABC's net interest income in 2014 is, in fact, driven by the mismatch in maturities of its short-term borrowing and long-term lending. The mismatch in itself does not necessarily create any value for shareholders, because they could set up a similar position in the bond market. The key question is whether ABC Bank can attract deposits and provide loans at better-than-market interest rates—and this is addressed by economic-spread analysis.

Impact of leverage and business risk on cost of equity As for industrial companies, the cost of equity for a bank such as ABC should reflect its business risk and leverage. Its equity beta is a weighted average of the betas of all its loan and deposit businesses. So when you project significant changes in a bank's asset or liability composition or equity capital ratios, you cannot leave the cost of equity unchanged.

For instance, if ABC were to decrease its equity capital ratio, its expected return on equity would go up. But in the absence of taxes, by itself this should not increase the intrinsic equity value, because ABC's cost of equity would also rise, as its cash flows would now be more risky. It will increase ABC's value only to the extent that the bank is creating value on the deposit business that it is growing as a result of the leverage increase (see next section, on economic-spread analysis).[8]

The same line of reasoning holds for changes in the asset or liability mix. Assume ABC raises an additional $50 million in equity and invests this in government bonds at the risk-free rate of 4.5 percent, reducing future returns on equity. If you left ABC's cost of equity unchanged at 10.9 percent, the estimated equity value per share would decline. But in the absence of taxation, the risk-free investment cannot be value-destroying, because its expected return exactly equals the cost of capital for risk-free assets. There is no impact on value creation if we assume that the bank has no competitive (dis)advantage in investing in government bonds. The assumption seems reasonable, as it implies that the bank does not obtain the government bonds at a premium or discount to their fair market value. As a result, if you accounted properly for the impact of the change in its asset mix on the cost of equity and the resulting reduction in the beta of its business, ABC's equity value would remain unchanged.

Tax penalty on holding equity risk capital Holding equity risk capital represents a cost for banks, and it is important to understand what drives this cost. Consider again the example of ABC Bank issuing new equity and investing in risk-free assets, thereby increasing its equity risk capital. In the absence of taxation, this extra layer of risk capital would have no impact on value, and there would be no cost to holding it. But interest income *is* taxed, and that is what makes holding equity risk capital costly; equity, unlike debt or deposits, provides no tax shield. In this example, ABC will pay taxes on the risk-free interest income from the $50 million of risk-free bonds that cannot be offset by tax shields on interest charges on deposits or debt, because the investment was funded with equity, for which there are no tax-deductible interest charges.

The true cost of holding equity capital is this so-called tax penalty, whose present value equals the equity capital times the tax rate. If ABC Bank were to increase its equity capital by $50 million to invest in risk-free bonds, holding everything else constant, this would entail destroying $15 million of present value (30 percent times $50 million) because of the tax penalty. As long as the cost of equity reflects the bank's leverage and business risk, the tax penalty is

[8]Note that leverage has a different impact on the value of banks than on the value of industrial companies. An industrial company's value is not affected by leverage in the absence of corporate income taxes because it is assumed that there is no value creation in the issuance of corporate debt raised at market rates (see Chapter 8).

implicitly included in the equity DCF. However, in the economic-spread analysis discussed next, we explicitly include the tax penalty as a cost of the bank's lending business.

Economic-Spread Analysis

Because the equity DCF approach does not reveal the sources of value creation in a bank, some further analysis is required. To understand how much value ABC Bank is creating in its different product lines, we can analyze them by their economic spread.[9] We define the pretax economic spread on ABC's loan business in 2014 as the interest rate on loans minus the matched-opportunity rate (MOR) for loans, multiplied by the amount of loans outstanding at the beginning of the year:

$$S_{BT} = L(r_L - k_L) = \$1,133.7 \text{ million } (6.5\% - 5.1\%) = \$15.9 \text{ million}$$

where S_{BT} is the pretax spread, L is the amount of the loans, r_L is the interest rate on the loans, and k_L is the MOR for the loans.

The matched-opportunity rate is the cost of capital for the loans—that is, the return the bank could have captured for investments in the financial market with similar duration and risk as the loans. Note that the actual interest rate a bank is paying for deposit or debt funding is not necessarily relevant, because the maturity and risk of its loans and mortgages often do not match those of its deposits and debt. For example, the MOR for high-quality four-year loans should be close to the yield on investment-grade corporate bonds with four years to maturity that are traded in the market. Banks create value on their loan business if the loan interest rate is above the matched-opportunity rate.

To obtain the economic spread after taxes (S_{AT}), it is necessary to deduct the taxes on the spread itself, a tax penalty on the equity required for the loan business (TPE), and the tax on any maturity mismatch in the funding of the loans (TMM):

$$S_{AT} = L(r_L - k_L)(1 - T) - \text{TPE} - \text{TMM}$$

The tax penalty on equity occurs because, in contrast to deposit and debt funding, equity provides no tax shield, as dividend payments are not tax deductible.[10] Thus, the more a bank relies on equity funding instead of deposits

[9] The approach is similar to those described by, for example, T. Copeland, T. Koller, and J. Murrin, *Valuation: Measuring and Managing the Value of Companies*, 4th ed. (New York: John Wiley & Sons, 2000); and J. Dermine, *Bank Valuation and Value-Based Management* (New York: McGraw-Hill, 2009).

[10] Debt funding provides a tax shield, whereas equity funding generates a tax penalty. See also Dermine, *Bank Valuation*, 77.

or debt, the less value it creates, everything else being equal. Of course, banks have to fund their operations at least partly with equity. One reason is that regulators in most countries have established solvency restrictions that require banks to hold on to certain minimum equity levels relative to their asset bases. In addition, banks with little or no equity funding would not be able to attract deposits from customers or debt, because their default risk would be too high. For ABC's loan business, this tax penalty in 2014 is calculated as follows:[11]

$$\begin{aligned}\text{TPE} &= T \times L \times e_L \times k_D \\ &= 30\%(\$1{,}133.7\text{ million})\,(8.0\%)\,(4.6\%) = \$1.3\text{ million}\end{aligned}$$

where e_L is the required equity capital divided by the amount of loans outstanding and k_D is the MOR for deposits.

In addition, the tax on a maturity mismatch (TMM) needs to be included if the maturity of the loans does not correspond to that of the bank's deposits. Typically, the maturity of a bank's loans is longer than that of the deposits by which it funds its operations, and a difference arises in the matched-opportunity rates. For example, in the case of ABC Bank, the loans have a longer maturity than the deposits. As a result, the MOR for loans (5.1 percent) is above the MOR for deposits (4.6 percent). The maturity difference in itself does not create or destroy any value, as it does not affect the economic spread on deposits or loans. But the taxation of the interest income that the mismatch generates has an impact on value, which should be included in the economic spread on loans. Note that the tax result on the maturity mismatch could be positive in the (unlikely) case that a bank's loans have a shorter maturity than its deposits. The TMM for ABC Bank's loans in 2014 is calculated as follows:

$$\begin{aligned}\text{TMM} &= T \times L\,(k_L - k_D) \\ &= 30\%\,(\$1{,}133.7\text{ million})\,(5.1\% - 4.6\%) = \$1.7\text{ million}\end{aligned}$$

The after-tax economic spread on loans is then derived as:

$$S_{AT} = \$15.9\text{ million}\,(1 - 30\%) - \$1.3\text{ million} - \$1.7\text{ million} = \$8.2\text{ million}$$

This number represents the dollar amount of value created by ABC's loan business. Along the same lines, we can define the economic spread for ABC Bank's deposit products as well (see Exhibit 34.8). Our analysis explicitly includes the spread on deposits because banks (in contrast to industrial companies) aim to create value in their funding operations. For example, ABC Bank created value for its shareholders in its deposit business in 2014 because it attracted deposits

[11] In case of multiple loan products, you can allocate the tax penalty to the individual product lines according to their equity capital requirements.

EXHIBIT 34.8 **ABC Bank: Historical Economic Spread by Product Line**

$ million

	2010	2011	2012	2013	2014
Loans interest rate, %	7.0	7.0	7.0	6.5	6.5
Matched-opportunity rate (MOR), %	5.5	5.5	5.5	5.5	5.1
Loans relative economic spread, %	1.5	1.5	1.5	1.0	1.4
Loans book value[1]	1,000.0	1,030.0	1,063.5	1,097.5	1,133.7
Loans economic spread before taxes	15.0	15.5	16.0	11.0	15.9
Taxes on economic spread	(4.5)	(4.6)	(4.8)	(3.3)	(4.8)
Tax penalty on equity and maturity mismatch	(2.1)	(3.1)	(3.8)	(4.5)	(3.0)
Loans economic spread[2]	8.4	7.8	7.4	3.2	8.2
Deposits interest rate, %	5.0	4.8	4.7	4.5	4.3
Matched-opportunity rate (MOR), %	5.0	4.7	4.6	4.5	4.6
Deposits spread, %	–	–0.1	–0.1	–	0.3
Deposits book value[1]	960.0	988.8	999.7	1,009.7	1,043.0
Deposits economic spread[2]	–	(0.7)	(0.7)	–	2.2

[1] Beginning of year.
[2] After taxes.

at a 4.3 percent interest rate, below the 4.6 percent rate for traded bonds with the same high credit rating as ABC had.[12]

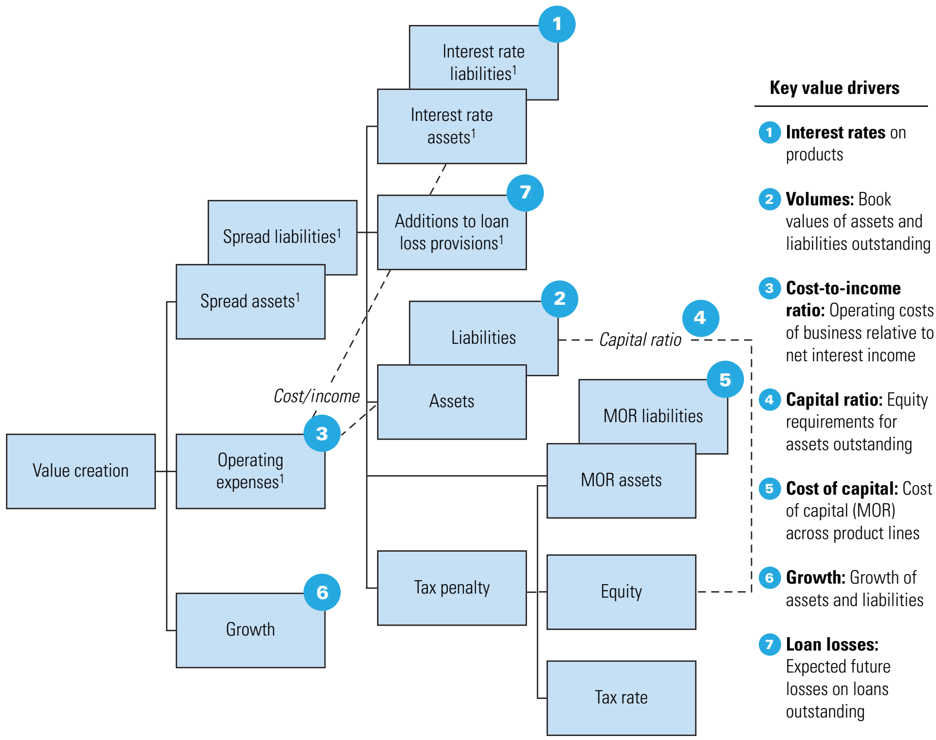
When comparing the spread across ABC product lines over the past few years, we can immediately see that most of the value created comes from its lending business. In fact, ABC was not making any money on its deposit funding from 2009 to 2013, as shown by the zero or negative spreads in those years.

From our calculations of the economic spreads of the two businesses, it is possible to rearrange the value driver tree from the equity DCF approach shown previously in Exhibit 34.5. In the revised value driver tree shown in Exhibit 34.9, the key drivers are virtually identical but highlight some important messages about value creation for banks:

- Interest income on assets creates value only if the interest rate exceeds the cost of capital for those assets (i.e., the matched-opportunity rate) by more than the taxes on any maturity mismatch.
- Changes in the capital ratio affect value creation only through the tax penalty on equity.
- Growth adds value only if the economic spread from the additional product sold is positive and sufficient to cover any operating expenses.

[12]Note that the spread for deposits does not include a tax charge for maturity mismatch and equity risk capital—these are included in the spread for loans.

EXHIBIT 34.9 **Generic Value Driver Tree for Retail Banking: Economic Spread**



[1] After taxes.

Note that we could further refine the tree by allocating the operating expenses to the product lines, represented by the different asset and liability categories. This is worth doing if there is enough information on the operating costs incurred by each product line and the equity capital required for each.

Economic Spread vs. Net Interest Income

The spread analysis helps to show why a bank's reported net interest income does not reveal the value created by the bank and should be interpreted with care. For example, out of ABC Bank's 2014 net interest income after taxes of \$20.2 million, only \$10.3 million represents true value created (the economic spread of \$8.2 million on loans plus \$2.2 million on deposits minus a rounding difference, as shown in Exhibit 34.10). The remaining \$9.9 million is income but not value, because it is offset by the following two charges shown in the exhibit:

1. The matched-capital charge, amounting to \$4.2 million for ABC in 2014, is the income that would be required on assets and liabilities if there

EXHIBIT 34.10 **ABC Bank: Net Interest Income and Value Creation**

$ million

	2014	Description
Net interest income (after tax)	20.2	$(1-T)(L\times r_L - D\times r_D)$
Matched-capital charge	4.2	$(L-D)\,k_D = (L\times e_L\times k_D)$
Mismatched-capital charge	5.7	$L\times(k_L - k_D)$
Economic spread (after tax)	10.3	$= (1-T)\,L\,(r_L-k_L) - T\times L\times e_L\times k_D - T\times L\,(k_L-k_D) + (1-T)\,D\,(r_D-k_D)$

$$\underbrace{\underbrace{(1-T)\,L\,(r_L-k_L)}_{S_{BT}=11.2} \underbrace{- T\times L\times e_L\times k_D}_{TPE=-1.3} \underbrace{- T\times L\,(k_L-k_D)}_{TMM=-1.7}}_{\text{For loans: 8.2}} + \underbrace{\underbrace{(1-T)\,D\,(r_D-k_D)}_{S_{BT}=2.2}}_{\text{For deposits: 2.2}}$$

were no maturity mismatch and no economic spread. In that case, all assets and liabilities would have identical duration (and risk) to deposits, so that their return would equal k_D (the MOR on deposits) and net interest income would equal equity times k_D. This component of net interest income does not represent value; it only provides shareholders the required return on their equity investment in a perfectly matched bank.[13]

2. The mismatched-capital charge, amounting to $5.7 million of ABC's net interest income, arises from the difference in the duration of ABC's assets and deposits. To illustrate, when a bank borrows at short maturity and invests at long maturity, it creates income. The income does not represent value when the risks of taking positions on the yield curve are taken into account. The mismatched-capital charge represents the component of net interest income required to compensate shareholders for that risk.[14]

Because economic-spread analysis provides such insights into value creation across a bank's individual product lines, we recommend using it to understand a bank's performance. We recommend using the DCF model to perform the valuation of the bank.

[13]The cost of capital for the bank's equity would then also equal k_D, because it is the value-weighted average of the cost of capital of all assets and liabilities.

[14]Note that the taxes on the matched capital and the maturity mismatch are included as charges in the economic spread.

COMPLICATIONS IN BANK VALUATIONS

When you value banks, significant challenges arise in addition to those discussed in the hypothetical ABC Bank example. In reality, banks have many interest-generating business lines, including credit card loans, mortgage loans, and corporate loans, all involving loans of varying maturities. On the liability side, banks could carry a variety of customer deposits as well as different forms of straight and hybrid debt. Banks need to invest in working capital and in property, plant, and equipment, although the amounts are typically small fractions of total assets. Obviously, this variety makes the analysis of real-world banks more complex, but the principles laid out in the ABC example remain generally applicable. This section discusses some practical challenges in the analysis and valuation of banks.

Convergence of Forward Interest Rates

For ABC Bank, we assumed a perpetual difference in short-term and long-term interest rates. As a result, ABC generates a permanent, positive net interest income from a maturity mismatch: using short-term customer deposits as funding for investments in long-term loans. However, following the expectations theory of interest rates, long-term rates move higher when short-term rates are expected to increase, and vice versa. Following this theory, it is necessary to ensure that our expectations for interest rates in future years are consistent with the current yield curve.

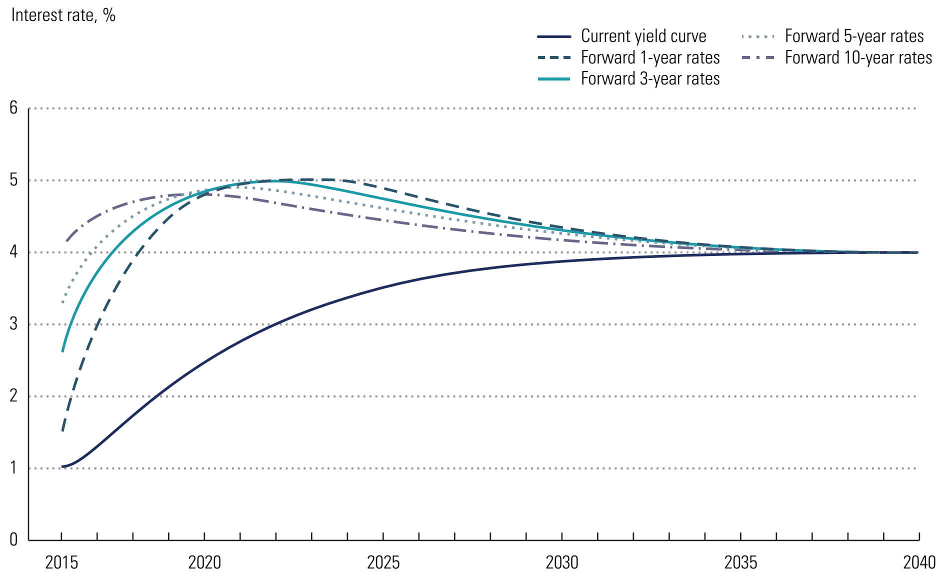
Exhibit 34.11 shows an example of a set of future one-, three-, five-, and ten-year interest rates that are consistent with the yield curve as of 2014. The forecasts for a bank's interest income and expenses should be based on these forward rates, which constitute the matched-opportunity rates for the different product lines. For example, if the bank's deposits have a three-year maturity on average, you should use the interest rates from the forward three-year interest rate curve minus an expected spread for the bank to forecast the expected interest rates on deposits in your DCF model. The rates are all derived from the current yield curve. To illustrate, the expected three-year interest rate in 2016 follows from the current three- and six-year yield:

$$r_{2016-2019} = \left[\frac{(1+Y_{2019})^6}{(1+Y_{2016})^3} - 1\right]^{\frac{1}{3}} = \left[\frac{(1+2.82\%)^6}{(1+1.66\%)^3} - 1\right]^{\frac{1}{3}} = 4.0\%$$

where $r_{2016-2019}$ is the expected three-year interest rate as of 2016, Y_{2016} is the current three-year interest rate, and Y_{2019} is the current six-year interest rate.

In practice, forward rate curves derived from the yield curve will rarely follow the smooth patterns of Exhibit 34.11. Small irregularities in the current yield curve can lead to large spikes and dents in the forward rate curves, which

EXHIBIT 34.11 **Yield Curve and Future Interest Rates**

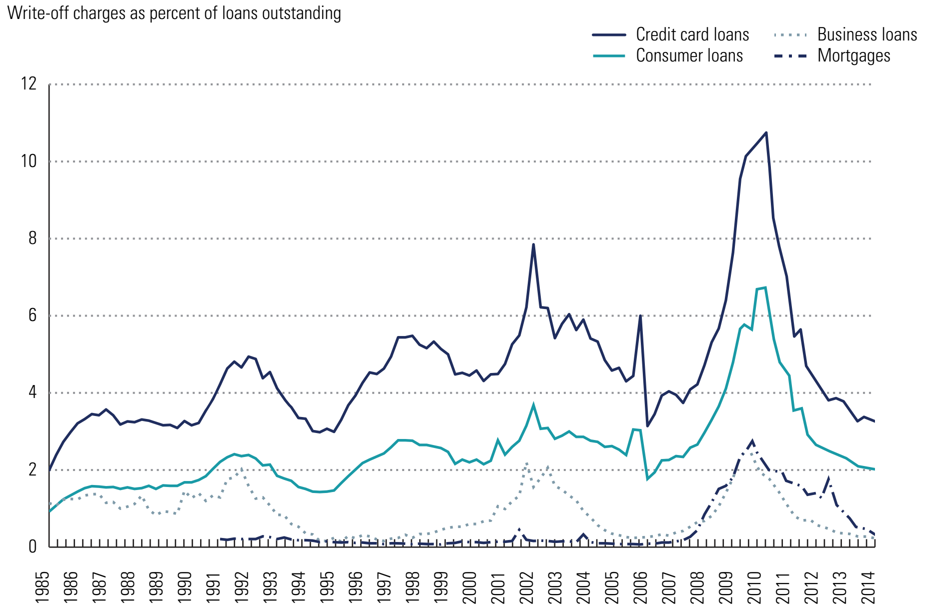


would produce large fluctuations in net interest income forecasts. As a practical solution, use the following procedure. First, obtain the forward one-year interest rates from the current yield curve. Then smooth these forward one-year rates to even out the spikes and dents arising from irregularities in the yield curve. Finally, derive the two-year and longer-maturity forward rates from the smoothed forward one-year interest rates. As the exhibit shows, all interest rates should converge toward the current yield curve in the long term. As a result, the bank's income contribution from any maturity difference in deposits and loans disappears in the long term as well.

Loan Loss Provisions

For our ABC Bank valuation, we did not model any losses from defaults on loans outstanding to customers. In real life, your analysis and valuation have to include loan loss forecasts, because loan losses are among the most important factors determining the value of retail and wholesale banking activities. For estimating expected loan losses from defaults across different loan categories, a useful first indicator would be a bank's historical additions to loan loss provisions or sector-wide estimates of loan losses (see Exhibit 34.12). As the exhibit shows, these losses increased sharply during the 2008 credit crisis but recovered to pre-crisis levels by 2013. Credit cards typically have the highest losses, and mortgages the lowest, with business loans somewhere in between. All default losses are strongly correlated with overall economic growth, so use

EXHIBIT 34.12 **Annual Losses for U.S. Banks by Loan Category**



Source: Federal Reserve, "Charge-Off and Delinquency Rates on Loans and Leases at Commercial Banks," www.federalreserve.gov.

through-the-economic-cycle estimates of additions to arrive at future annual loan loss rates to apply to your forecasts of equity cash flows.

To project the future interest income from a bank's loans, deduct the estimated future loan loss rates from the future interest rates on loans for each year. You should also review the quality of the bank's current loan portfolio to assess whether it is under- or overprovisioned for loan losses. Any required increase in the loan loss provision translates into less equity value. Many banks may need to make such an increase in the wake of the credit crisis.

Risk-Weighted Assets and Equity Risk Capital

Banks are required to hold a minimum level of equity capital that can absorb potential losses to safeguard the bank's obligations to its customers and financiers. In December 2010, new regulatory requirements for capital adequacy were specified in the Basel III guidelines, replacing the 2007 Basel II accords, which were no longer considered adequate in the wake of the 2008 and 2010 financial crises.[15] The new guidelines are being gradually implemented by banks across the world between 2013 and 2019.

[15]The Basel accords are recommendations on laws and regulations for banking and are issued by the Basel Committee on Banking Supervision (BCBS).

EXHIBIT 34.13 **Estimating Risk-Weighted Assets (RWA) for a Large European Bank**

€ billion

	Reported RWA				Estimated RWA parameters, %			
	Year	**Asset category**	**Loans outstanding**	**RWA**	**Standardized RWA/loans**	**Standardized RWA**	**Allocated RWA**	**Estimated RWA/loans**
Credit risk	2013	Loans to countries	16,228		10	1,623	2,220	14
		Loans to banks	25,100		35	8,785	12,016	48
		Loans to corporations	147,242		35	51,535	70,486	48
		Residential mortgages	148,076		35	51,827	70,885	48
		Other consumer loans	45,440		75	34,080	46,613	103
		Overall	382,086	202,219		147,489	202,219	53

	Year	VaR trading book	RWA	Estimated RWA/ VaR
Market risk	2013	19,564	47,259	242

	Year	Revenues	RWA	Estimated RWA/ revenues
Operational risk	2013	32,826	50,891	155

Basel III specifies rules for banks regarding how much equity capital they must hold based on the bank's so-called risk-weighted assets (RWA).[16] The level of RWA is driven by the riskiness of a bank's asset portfolio and its trading book. Banks have some flexibility to choose either internal risk models or standardized Basel approaches to estimate their RWA. All such models rest on the general principle that the total RWA is the sum of separate RWA estimates for credit risk, market risk, and operational risk. However, banks do not publish the risk models they use. If you are conducting an outside-in valuation, you need an approximation of a bank's future equity risk capital needs. Because banks typically provide information on total RWA but not on the risk weighting for its asset groups, trading book, and operations, you have to make an approximation of the key categories' contribution to total RWA for the bank in order to project RWA and risk capital for future years.[17]

Exhibit 34.13 shows such an outside-in approximation of RWA for a large European bank. The bank separately reports the total RWA for credit risk, market risk, and operational risk.

[16] In addition, Basel III sets requirements for liquidity and restrictions on leverage in the form of a minimum liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) and a threshold leverage ratio (LR). We focus here on capital adequacy, as that is typically the most critical requirement to take into account when valuing a bank.

[17] Without RWA estimates by business line, you could only project the bank's risk capital for a scenario in which all business lines grow at the same rate.

EXHIBIT 34.14 **Risk Weights in Basel II Standardized Approach**

%

	Asset category						
Credit risk	**AAA to AA–**	**A+ to A–**	**BBB+ to BBB–**	**BB+ to BB–**	**B+ to B–**	**Below B–**	**Unrated**
Loans to countries	–	20	50	100	100	150	100
Loans to banks	20	50	50	100	100	150	50
Loans to corporations	20	50	100	100	150	150	100
Residential mortgages	Local regulator flexibility: Mortgages with low loan-to-value ratio, 35%; otherwise, 100%						
Other consumer loans	Risk weighting of 75%						

- To approximate the RWA for *credit risk*, you can use the risk weights from the Basel II Standardized Approach (see Exhibit 34.14) and information on the credit quality of the bank's loans. Estimate the risk weighting and RWA for each of the loan categories in such a way that your estimate fits the reported RWA for all loans (€202 billion in this example).
- *Market risk* is a bank's exposure to changes in interest rates, stock prices, currency rates, and commodity prices. It is typically related to its value at risk (VaR), which is the maximum loss for the bank under a worst-case scenario of a given probability for these market prices. For an approximation, use the reported VaR over several years to estimate the bank's RWA as a percentage of VaR (242 percent in the example).
- *Operational risk* is all risk that is neither market nor credit risk. It is usually related to a bank's net revenues (net interest income plus net other income). Use the bank's average revenues over the previous year(s) to estimate RWA per unit of revenue (155 percent in the example).

Based on your forecasts for growth across different loan categories, VaR requirements for trading activities, and a bank's net revenues, you can estimate the total RWA in each future year.

Basel III establishes stricter rules for banks regarding how much capital they must hold based on their level of RWA. Requirements are defined for the bank's so-called common-equity Tier 1 (CET1), additional Tier 1, and Tier 2 capital levels, relative to RWA. Of these capital ratios, CET1 to RWA is typically the most stringent. The total minimum CET1 requirements for a bank consist of different layers that add up to a total of 7.0 to 9.5 percent of RWA:

Basel III CET1 capital requirements	
Percent of risk-weighted assets	
Legal minimum	4.5
Capital conservation buffer	2.5
G-SIB countercyclical buffer	0.0–2.5
Total	7.0–9.5

The first 4.5 percent is the so-called legal minimum that applies to any bank in any given year. The second layer of 2.5 percent is the capital conservation buffer, which can be drawn down in years of losses and then rebuilt in profitable years. The third, or countercyclical, layer can be up to 2.5 percent of RWA but applies only to so-called global systemically important banks (G-SIBs). These banks are identified by the Financial Stability Board (FSB) as sources of systemic risk to the international financial system because of their size and complexity.[18] In November of each year, the FSB publishes the additional capital charge for each G-SIB, which depends on the FSB's assessment of the risk that the bank represents. In 2013, some of the largest global banks, such as Citigroup, JPMorgan Chase, Deutsche Bank, and HSBC, faced a surcharge of 2.5 percent. For the next tier of G-SIBs, such as Santander, Crédit Agricole, and Wells Fargo, the surcharge amounted to 1.0 percent.

Although the new Basel capital adequacy rules are not fully phased in until 2019, many banks nowadays already target CET1 at around 10 percent of RWA, anticipating not only the new regulations but also increased investor requirements. According to the Bank for International Settlements (BIS), the worldwide average CET1 for large international banks as well as smaller regional banks was at 9.5 percent of RWA in 2013.[19]

Using your RWA forecasts and the targeted CET1 ratio, you can estimate the required Tier 1 capital in each future year. From the projected CET1 capital requirements, you can estimate the implied shareholders' equity requirements by applying an average historical ratio of CET1 capital to shareholders' equity excluding goodwill and deferred-tax assets. Historical Tier 1 capital is reported separately in the notes to the bank's financial statements and is typically close to straightforward shareholders' equity excluding goodwill and deferred-tax assets.

Value Drivers for Different Banking Activities

Given that many banks have portfolios of different business activities, sometimes as distinct as consumer credit card loans and proprietary trading, their businesses can have very distinct risks and returns, making the bank's consolidated financial results difficult to interpret, let alone forecast. The businesses are best valued separately, as in the case of multibusiness companies, discussed in Chapter 17. Unfortunately, financial statements for multibusiness banks often lack separately reported income statements and balance sheets for different business activities. In that case, you have to construct separate statements following the guidelines described in Chapter 17.

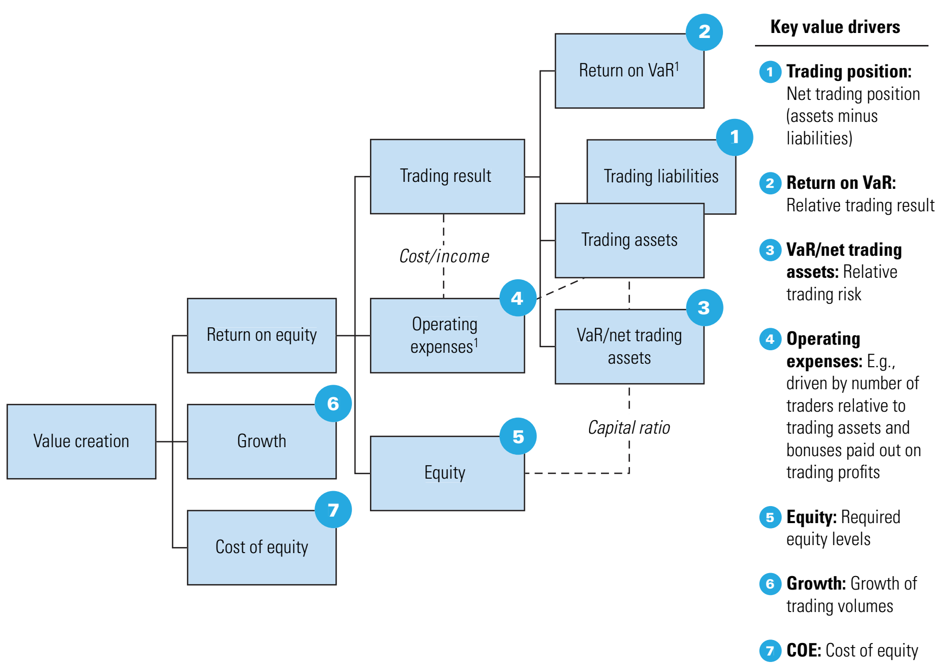
[18]The FSB is an international body monitoring the stability of the international financial system and was established by the G20 Leaders Summit of April 2009.
[19]Bank for International Settlements, 84th Annual Report, June 2014, 104.

Interest-generating activities Retail banking, credit card services, and wholesale lending generate interest income from large asset positions and risk capital. These interest-generating activities can be analyzed using the economic-spread approach and valued using the equity DCF model, as discussed for ABC Bank in the previous section.

Trading activities Like a bank's interest-generating activities, its trading activities also generate income from large asset positions and significant risk capital. However, trading incomes tend to be far more volatile than interest incomes. Although peak income can be very high, the average trading income across the cycle generally turns out to be limited. The key value drivers are shown in Exhibit 34.15, a simplified value driver tree for trading activities.

You can think of a bank's trading results as driven by the size of its trading positions, the risk taken in trading (as measured by the total VaR), and the trading result per unit of risk (measured by return on VaR). The ratio of VaR to net trading position is an indication of the relative risk taking in trading. The more risk a bank takes in trading, the higher the expected trading return should be, as well as the required risk capital. The required equity risk capital

EXHIBIT 34.15 **Value Drivers: Trading Activities (Simplified)**



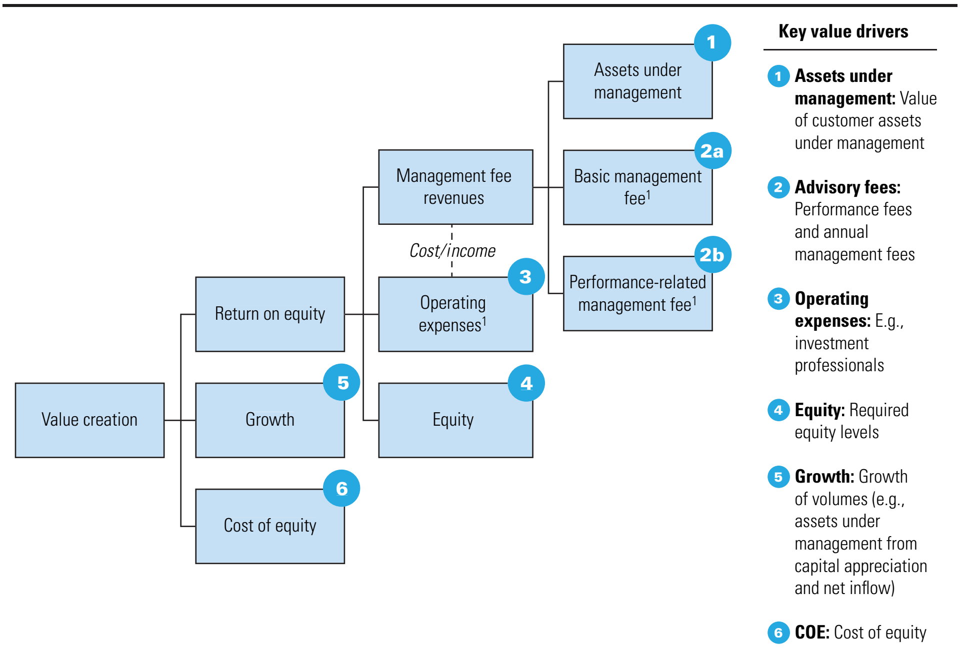
[1] After taxes.

for the trading activities follows from the VaR (and RWA), as discussed earlier in the chapter. Operating expenses, which include information technology (IT) infrastructure, back-office costs, and employee compensation, are partly related to the size of positions (or number of transactions) and partly related to trading results (e.g., employee bonuses).

Fee- and commission-generating activities A bank's fee- and commission-generating activities, such as brokerage, transaction advisory, and asset management services, have different economics, based on limited asset positions and minimal risk capital. The value drivers in asset management, for example, are very different from those in the interest-generating businesses, as the generic example in Exhibit 34.16 shows. Key drivers are the growth of assets under management and the fees earned on those assets, such as management fees related to the amount of assets under management and performance fees related to the returns achieved on those assets.

Along with these variables in activities, remember that banks are highly leveraged and that many of their businesses are cyclical. When performing a bank valuation, you should not rely on point estimates but should use scenarios for future financial performance to understand the range of possible outcomes and the key underlying value drivers.

EXHIBIT 34.16 **Value Drivers: Asset Management (Simplified)**



[1] After taxes.

SUMMARY

The fundamentals of the discounted-cash-flow (DCF) approach laid out in this book apply equally to banks. The equity cash flow version of the DCF approach is most appropriate for valuing banks, because the operational and financial cash flows of these organizations cannot be separated, given that banks are expected to create value from funding as well as lending operations.

Valuing banks remains a delicate task because of the diversity of the business portfolio, the cyclicality of many bank businesses (especially trading and fee-based business), and high leverage. Because of the difference in underlying value drivers, it is best to value a bank by its key parts according to the source of income: interest-generating business, fee and commission business, and trading. To understand the sources of value creation in a bank's interest-generating business, supplement the equity DCF approach with an economic-spread analysis. This analysis reveals which part of a bank's net interest income represents true value creation and which reflects not value but charges for maturity mismatch and capital. When forecasting a bank's financials, handle the uncertainty surrounding the bank's future performance and growth by using scenarios that capture the cyclicality of its key businesses.

35

Flexibility

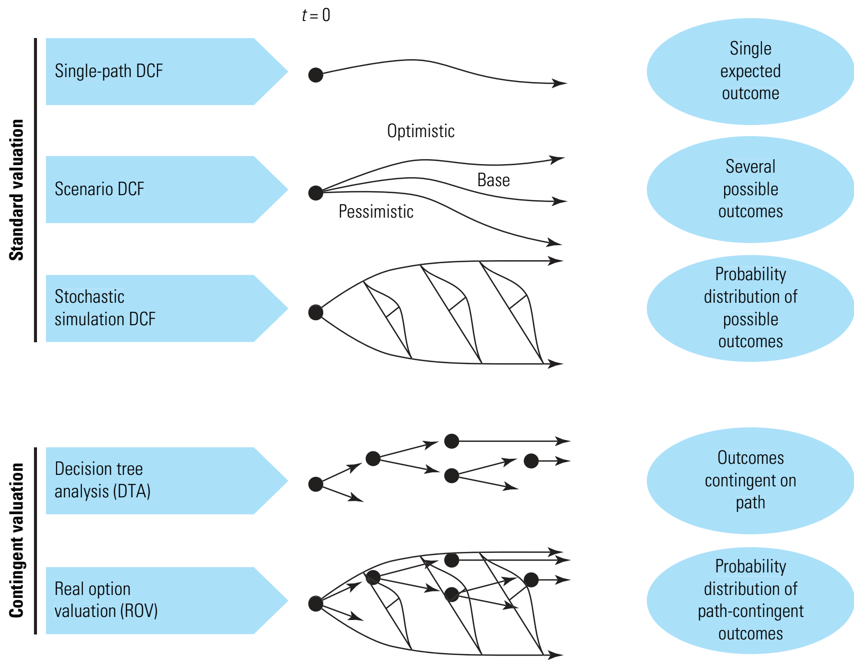
Managerial flexibility is not the same as uncertainty. In the case of uncertainty, the future of a company or a project may be very difficult to predict and depend on a single management decision—for example, to launch a new product line or to invest in a new production facility. Whatever the degree of uncertainty, it is possible to value the asset in question either by using a *standard* discounted-cash-flow (DCF) approach combined with either different scenarios or a stochastic simulation (see, for example, Chapter 15).

Flexibility, in contrast, refers to choices managers may make between alternative plans in response to events. Suppose management has planned to stage its investments in a business start-up. In that case, the managers may decide at each stage whether to proceed, depending on information arising from the previous stage. Where managers expect to respond flexibly to events, they need so-called *contingent valuation* approaches, which forecast, implicitly or explicitly, the future free cash flows, depending on the future states of the world and management decisions, and then discount these to today's value.

To summarize when it is best to apply each of the various approaches, Exhibit 35.1 illustrates a hierarchy of standard and contingent approaches to valuation under uncertainty and flexibility. When a flexible response is neither expected nor required, you can choose from the following three variations of a *standard DCF* approach, depending on the level of uncertainty:

- *Single-path DCF valuation:* When little uncertainty exists about future outcomes, or when it is evenly spread around the expected outcomes, use a standard, single-path DCF analysis based on point estimates of future cash flows.
- *Scenario-based DCF:* When significant uncertainty exists, especially when there is a possibility of much more upside than downside (or vice versa) in future cash flows, it is best to model future outcomes in two or more scenarios that capture the variation in the paths of future cash flow. This

EXHIBIT 35.1 **Valuation under Uncertainty: Approaches**



approach is solid and easy to apply in, for example, valuing corporate or business strategies.

- *Stochastic simulation DCF:* If you have reliable estimates about the underlying probability distributions of cash flows into the future, such as mean, standard deviation, and possibly skewness, it may be worthwhile to use a stochastic simulation DCF approach. In this approach, future cash-flow paths are explicitly modeled and valued in a stochastic simulation. Because this approach is complex and requires voluminous data, applications are mostly restricted to specific industries, such as the valuation of insurance companies, and commodity-based businesses.

When managerial flexibility is called for, you need one of the following *contingent valuation* approaches, selected according to the amount of information available:

- *Decision tree analysis (DTA):* If there is limited information about the distribution of future cash-flow paths and the decisions that management can take depending on these cash flows, use a decision tree analysis (see Exhibit 35.1). As the following sections discuss, it builds on scenario DCF valuation and is straightforward and transparent. DTA is especially effective for valuing flexibility related to technological risks that are not priced in the market, such as investments in research and development (R&D) projects, product launches, and plant-decommissioning decisions.

- *Real-option valuation (ROV):* If you have reliable information about the underlying probability distributions of future cash-flow paths, similar to that required for stochastic simulation, a real-option valuation (ROV) could provide better results and insights. However, it requires sophisticated, formal option-pricing models that are harder for managers to decipher than DTA. The ROV approach is best suited to decisions in commodity-based businesses, such as investments in oil and gas fields, refining facilities, chemical plants, and power generators, because the underlying commodity risk is priced in the market.[1]

There are advantages to using either ROV or DTA, depending on the types of risks involved. In theory, ROV is more accurate. But it is not the right approach in every case. By definition, it cannot replace traditional discounted cash flow, because valuing an option using ROV still depends on knowing the value of the underlying assets. Unless the assets have an observable market price, you will have to estimate that value using traditional DCF.

Company-wide valuation models rarely take flexibility into account. To analyze and model flexibility accurately, you must be able to describe the set of specific decisions managers could make in response to future events, and include the cash flow implications of those decisions. In valuing a company, flexibility therefore becomes relevant only in cases where management responds to specific events that may change the course of the whole company. For example, to value Internet or biotech companies with a handful of promising new products in development, you could project sales, profit, and investments for the company as a whole that are conditional on the success of product development.[2] Another example is a company that has built its strategy around buying up smaller players and integrating them into a bigger entity, capturing synergies along the way. The first acquisitions may not create value in their own right, but may open opportunities for value creation through further acquisitions.

Flexibility is typically more relevant in the valuation of individual businesses and projects, as it mostly concerns detailed decisions related to production, capacity investment, marketing, research and development, and other

[1]See, for example, E. S. Schwartz and L. Trigeorgis, eds., *Real Options and Investment under Uncertainty: Classical Readings and Recent Contributions* (Cambridge, MA: MIT Press, 2001); T. Copeland and V. Antikarov, *Real Options: A Practitioner's Guide* (New York: Texere, 2003); or L. Trigeorgis, *Real Options: Managerial Flexibility and Strategy in Resource Allocation* (Cambridge, MA: MIT Press, 1996).

[2]See, for example, E. S. Schwartz and M. Moon, "Rational Pricing of Internet Companies," *Financial Analysts Journal* 56, no. 3 (2000): 62–75; and D. Kellog and J. Charnes, "Real-Options Valuation for a Biotechnology Company," *Financial Analysts Journal* 56, no. 3 (2000): 76–84.

factors. This chapter concentrates on the basic concepts of valuing managerial flexibility and real options in businesses and projects. It focuses on the following topics:

- Fundamental concepts behind uncertainty, flexibility, and value (when and why flexibility has value)
- Managing flexibility in terms of real options to defer investments; making follow-on investments; and expanding, changing, or abandoning production
- Comparison of DTA and ROV to valuing flexibility, including situations in which each approach is most appropriate
- A four-step approach to analyzing and valuing real options, illustrated with numerical examples using ROV and DTA

UNCERTAINTY, FLEXIBILITY, AND VALUE

To appreciate the value of flexibility and its key value drivers, consider a simple example:[3] Suppose you are deciding whether to invest \$6,000 one year from now to produce and distribute a new pharmaceutical drug already under development. In the upcoming final development stage, the product will undergo clinical tests on patients for one year, for which all investments have already been made. These tests involve no future cash flows. The trials could have one of two possible outcomes. If the drug proves to be highly effective, it will generate an annual net cash inflow of \$500 into perpetuity. If it is only somewhat effective, the annual net cash inflow will be \$100 into perpetuity. These outcomes are equally probable.

Based on this information, the expected future net cash flow is \$300, the probability-weighted average of the risky outcomes (\$500 and \$100). We assume that success in developing the new product and the value of the new product are unrelated to what happens in the overall economy, so this risk is fully diversifiable by the company's investors. Therefore, the cost of capital for this product equals the risk-free rate, say 5 percent (remember, only nondiversifiable risk requires a premium). Assuming that the company will realize its first year's product sales immediately upon completing the trials and at the end of each year thereafter, the net present value (NPV) of the investment is estimated as follows:

$$\text{NPV} = \frac{-\$6,000}{1.05} + \sum_{t=1}^{\infty} \frac{\$300}{(1.05)^t} = \$286$$

[3] The example is inspired by A. Dixit and R. Pindyck, *Investment under Uncertainty* (Princeton, NJ: Princeton University Press, 1994), 26.

To apply the NPV approach, we discount the incremental expected project cash flows at the cost of capital. Any prior development expenses are irrelevant because they are sunk costs. Alternatively, if the project is canceled, the NPV equals \$0. Therefore, management should approve the incremental investment of \$6,000.

In this example of the NPV decision rule, undertaking development creates value. But there are more alternatives than deciding *today* whether to invest. Using an approach similar to the scenario approach described in Chapter 15, we can rewrite the previous NPV calculation in terms of the probability-weighted values of the drug, discounted to today:

$$\begin{aligned}\text{NPV} &= 0.5\left[\frac{-\$6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{\$500}{(1.05)^t}\right]+0.5\left[\frac{-\$6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{\$100}{(1.05)^t}\right]\\ &= 0.5(\$4{,}286)+0.5(-\$3{,}714)\\ &= \$286\end{aligned}$$

Here, the NPV is shown as the weighted average of two distinct results: a positive NPV of \$4,286 following a favorable trial outcome and a negative NPV of –\$3,714 for an unfavorable outcome. If the decision to invest can be deferred until trial results are known, the project becomes much more attractive. Specifically, if the drug proves to be less effective, the project can be halted, avoiding the negative NPV. You need invest only if the drug is highly effective, and the annual cash flow of \$500 more than compensates for the incremental investment.

This flexibility is an option to defer the investment decision. To value the option, a contingent NPV approach can be used, working from right to left in the payoff tree shown in Exhibit 35.2:

$$\begin{aligned}\text{NPV} = 0.5\times\text{Max}&\left[\left(\frac{-\$6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{\$500}{(1.05)^t}\right),0\right]\\ &+0.5\times\text{Max}\left[\left(\frac{-\$6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{\$100}{(1.05)^t}\right),0\right]\\ &= 0.5(\$4{,}286)+0.5(0)=\$2{,}143\end{aligned}$$

The contingent NPV of \$2,143 is considerably higher than the \$286 NPV of committing today. Therefore, the best alternative is to defer a decision until the trial outcomes are known. The value of the option to defer investment is the difference between the value of the project with flexibility and its value without flexibility: \$2,143 – \$286 = \$1,857.

EXHIBIT 35.2 **Value of Flexibility to Defer Investment**

$

$t = 0$				**$t = 1$**	**$t = 2$**	...	**?**
	$p =$	*Successful product* 50%	Cash flow	500	500	...	500
Contingent NPV = 2,143			Investment	(6,000)	–	...	–
	$1 - p =$	50% *Unsuccessful product*	Cash flow	100	100	...	100
Cost of capital = 5%			Investment	(6,000)	–	...	–

Note: t = time, in years
p = probability

Based on this example, it is possible to summarize the distinction between the standard and contingent NPVs. The standard NPV is the maximum, decided today, of the expected discounted cash flows or zero:

$$\text{Standard NPV} = \underset{t=0}{\text{Max}}\left(\frac{\text{Expected (Cash Flows)}}{\text{Cost of Capital}}, 0\right)$$

The contingent NPV is the expected value of the maximums, decided when information arrives, of the discounted cash flows in each future state or zero:

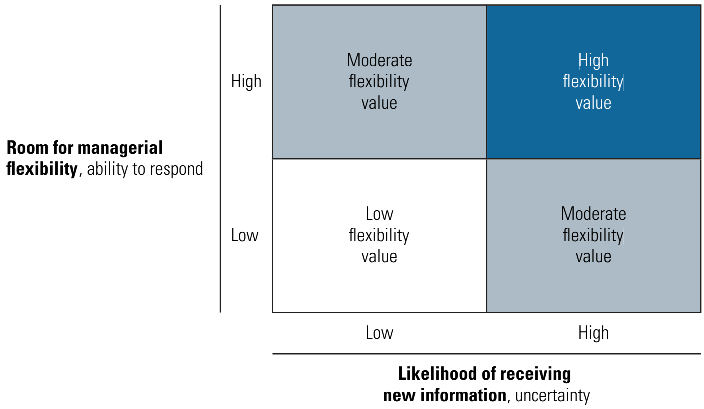
$$\text{Contingent NPV} = \text{Expected}_{t=0}\left[\text{Max}\left(\frac{\text{Cash Flows Contingent on Information}}{\text{Cost of Capital}}, 0\right)\right]$$

These two NPV approaches use information quite differently. Standard NPV forces a decision based on today's expectation of future information, whereas contingent NPV permits the flexibility of making decisions after the information arrives. Unlike standard NPV, it captures the value of flexibility. A project's contingent NPV will always be greater than or equal to its standard NPV.

The value of flexibility is related to the degree of uncertainty and the room for managerial reaction (see Exhibit 35.3). It is greatest when uncertainty is high and managers can react to new information. In contrast, if there is little uncertainty, managers are unlikely to receive new information that would alter future decisions, so flexibility has little value. In addition, if managers cannot act on new information that becomes available, the value of flexibility also is low.

Including flexibility in a project valuation is most important when the project's standard NPV is close to zero—that is, when the decision whether to go ahead with the project is a close call. Sometimes senior management intuitively overrules standard NPV results and accepts an investment project for

EXHIBIT 35.3 **When Is Flexibility Valuable?**



strategic reasons. In these cases, the flexibility recognized in contingent valuation fits better with strategic intuition than do the rigid assumptions of standard NPV approaches.

What Drives Flexibility Value

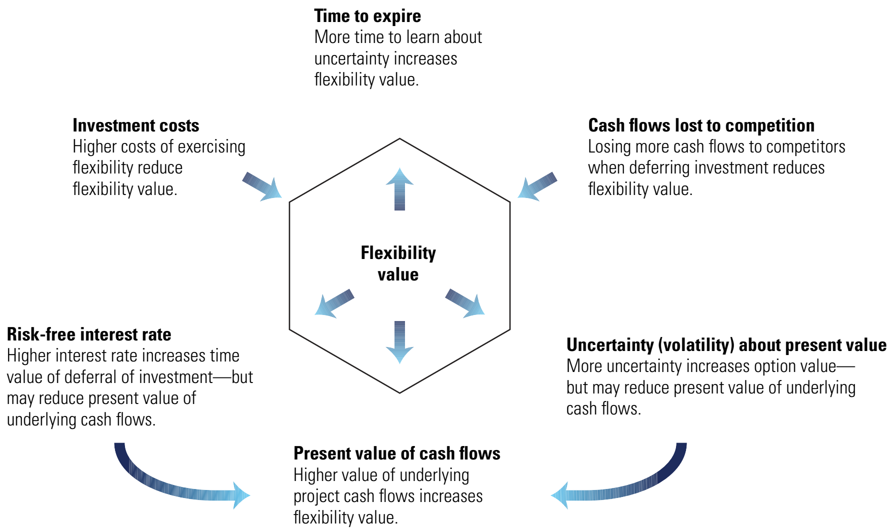
To identify and value flexibility, you must understand what drives its value. Consider what happens if the range of possible annual cash flow outcomes (originally \$500 versus \$100 per year) increases to \$600 versus \$0. Since expected cash flows and cost of capital remain unchanged, the standard NPV is the same (\$286).[4] However, the contingent NPV increases from its prior level of \$2,143:

$$
\begin{aligned}
\text{NPV} &= 0.5 \times \text{Max}\left[\left(\frac{-\$6,000}{1.05} + \sum_{t=1}^{\infty} \frac{\$600}{(1.05)^t}\right), 0\right] \\
&\quad + 0.5 \times \text{Max}\left[\left(\frac{-\$6,000}{1.05} + \sum_{t=1}^{\infty} \frac{\$0}{(1.05)^t}\right), 0\right] \\
&= 0.5(\$6,286) + 0.5(0) \\
&= \$3,143
\end{aligned}
$$

The contingent NPV of \$3,143 is almost 50 percent greater at this higher level of uncertainty. Why? The investment is made only if the drug is highly effective (that is, under a favorable trial outcome), so only the cash flows from

[4]We assume that the trial outcome risk is uncorrelated with the overall economy.

EXHIBIT 35.4 **Contributors to Flexibility Value**



the favorable outcome affect the contingent valuation. Since the cash flow projections contingent on the favorable outcome have increased by 20 percent and the required investment has not changed, the contingent NPV increases substantially. The value of the deferral option rises from \$1,857 to \$2,857 (computed as \$3,143 – \$286).

We can formally derive the key value drivers of real options by making an analogy with financial options and option-pricing theory. In our original example, the deferral option is identical to a call option with an exercise price of \$6,000 and a one-year maturity on an underlying risky asset that has a current value of \$6,000 and a variance determined by the cash flow spread of \$400 across outcomes.[5] As with financial options, the value of a real option depends on six drivers, summarized in Exhibit 35.4.

These drivers of option value show how allowing for flexibility affects the valuation of a particular investment project. Holding other drivers constant, option value decreases with higher investment costs and more cash flows lost while holding the option. Option value increases with higher value of the underlying asset's cash flows, greater uncertainty, higher interest rates, and a longer lifetime of the option. With higher option values, a standard NPV calculation that ignores flexibility will more seriously underestimate the true NPV.

[5]The current value of the underlying risky asset is the present value of expected annual cash flows of \$300 into perpetuity, discounted at a 5 percent cost of capital.

Be careful how you interpret the impact of value drivers when designing investment strategies to exploit flexibility. The impact of any individual driver described in Exhibit 35.4 holds only when all other value drivers remain constant. In practice, changes in uncertainty and interest rates not only affect the value of the option but usually change the value of the underlying asset as well. When you assess the impact of these drivers, you need to assess all their effects on the option's value, both direct and indirect. Take the case of higher uncertainty. In our example, we increased the uncertainty of future cash flows without changing the expectation or present value. But if greater uncertainty lowers the expected level of cash flows or raises the cost of capital, the impact on the value of the option could be negative, because the value of the underlying assets declines. The same holds for the impact of an interest rate increase. Higher interest rates reduce the present value of the required investment, thereby increasing the option value—if the value of the underlying asset is assumed constant. In reality, higher interest rates would also reduce the present value of cash flows on the underlying asset, which would lower the option's value.

MANAGING FLEXIBILITY

Contingent valuation is an important tool for managers trying to make the right decisions to maximize shareholder value when faced with strategic or operating flexibility. In actual practice, however, flexibility is never as well defined and straightforward as in the preceding examples. Much depends on management's ability to recognize, structure, and manage opportunities to create value from operating and strategic flexibility. A detailed discussion is beyond the scope of this book,[6] but we provide some basic guidelines here.

To *recognize* opportunities for creating value from flexibility when assessing investment projects or strategies, managers should try to be as explicit as possible about the following details:

- *Events:* What are the key sources of uncertainty? Which events will bring new information and when? A source of uncertainty is important only if relevant new information about it is likely to trigger a change in decision. For example, investing in a pilot project for a product launch makes sense only if there is a chance that the pilot outcome would actually change the launch decision. Similarly, options to switch inputs for manufacturing processes are valuable only if the input prices can be expected to diverge significantly.

[6]For a more in-depth discussion, see, for example, Copeland and Antikarov, *Real Options*, or Trigeorgis, *Real Options*.

- *Decisions:* What decisions can management make in response to events? It is important that managers have some discretion to react to a relevant event. If, say, they would like to pull out of developing a product when intermediate results are disappointing but are prevented by contractual agreements, they do not have true management flexibility. Similarly, intense competition can make it unattractive for managers to defer a decision to launch a new product until they have more information about potential demand.
- *Payoffs:* What payoffs are linked to these decisions? Bear in mind that there should be a positive NPV to be captured in some realistic future state of the world. This NPV should be derived from sustainable competitive advantages. In the late 1990s, some established retail companies acquired Internet start-ups as options for future growth, expecting them to produce significant additional online sales. But in many cases, the retail companies failed to test adequately the competitive advantage and value creation potential of these start-ups under realistic future scenarios.

With regard to *structuring* flexibility, some projects or strategies have predefined, built-in flexibility. Take, for example, research and development (R&D) investments in pharmaceutical products where the outcomes of clinical or patient trials provide natural moments to decide whether to stop or proceed with investments. But in many other cases, flexibility can be incorporated into a project to create maximum value. One example would be redesigning infrastructure investments in ports or airfields in stages such that future expansion takes place only if and when needed. Another would be reshaping a growth strategy in such a way that it explicitly includes options to redirect resources as more information becomes available.

In the end, flexibility has value only if managers actually *manage* it—that is, use new information to make appropriate changes to their decisions. Therefore, companies should ensure that their managers face proper incentives to capture potential value from flexibility. For example, the option to pull out of a staged-investment project when intermediate results are disappointing has no value if managers do not act on the information. As is sometimes the case, managers will point to nothing more than large investments already made as the rationale for their inaction. In the case where a company bases its strategy on creating growth options through a string of acquisitions, those options generate maximum value only if the company delays further acquisitions until new, positive information about their potential arrives. The company leaves the option value on the table if it proceeds with additional acquisitions in the dark.

To help managers recognize, structure, and manage opportunities for capturing value from flexibility, we segment options into the categories described in Exhibit 35.5 and provide some examples.

EXHIBIT 35.5 **Classification of Real Options**

Option type	Financial equivalent	Definition	Example(s)
Option to defer investment	Call option	The option to defer an investment until the present value of an asset rises above the development costs.	The ability of a leaseholder of an undeveloped oil reserve to defer development and investment until oil prices have elevated the value of the reserves above their development costs.
Abandonment option	Put option	The option to abandon a project if its present value falls below its liquidation value.	Long-term rental leases of airplanes that give the lessee the flexibility to prematurely dissolve the contract and return the plane to the lessor at a prespecified termination fee.
Follow-on (compound) option	Series of options on options	The option to invest in stages, contingent on performance.	A factory, R&D program, new-product launch, or oil field built so that management can continue the project at each stage by investing additional funds (an exercise price) or abandon it for whatever it can fetch.
Option to expand or contract	Call or put option	The option to resize an investment depending on performance.	A production facility built so that it can be easily expanded or contracted if a product is more or less successful than anticipated.
Option to extend or shorten	Call or put option	The option to shorten or extend the life of an asset or contract.	Real estate leases with clauses that allow lessors to extend or shorten the term of the lease.
Option to increase scope	Call option	The ability to increase or decrease the number of activities in the future.	A hotel designed so that the owner can easily diversify beyond lodging services, such as by adding conference facilities.
Switching options	Portfolio of call and put options	The ability to switch the operation of a project on and off—or to switch operations between two distinct locations.	A flexible manufacturing system that can produce two or more different products, peak-load power generation, or the ability to exit and reenter an industry.

METHODS FOR VALUING FLEXIBILITY

As mentioned earlier in this chapter, the two methods for contingent valuation are decision tree analysis (DTA) and real-option valuation (ROV) using formal option-pricing models. We will illustrate each method with a simple example: the opportunity to invest \$105 at the end of one year in a mining project that has an equal chance of returning either \$150 or \$50 in cash flow, depending on the mineral price. The risk-free rate, r_f, is 5 percent, and the weighted average cost of capital (WACC) for the project is 10 percent. The present value (PV) of the cash flows today is:

$$\text{PV} = \frac{0.5(\$150) + 0.5(\$50)}{1.10} = \$90.9$$

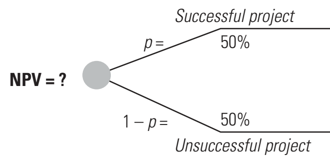
If an investment decision were required immediately, the project would be declined. The standard NPV of the mining project equals the discounted expected cash flow of \$90.90 minus the present value of the investment outlay of \$105 next year. Since the level of investment is certain, it should be discounted at the risk-free rate of 5 percent:

$$\text{Standard NPV} = \$90.9 - \frac{\$105}{1.05} = \$90.9 - \$100 = -\$9.1$$

EXHIBIT 35.6 **Contingent Payoffs for Investment Project, Twin Security, and Risk-Free Bond**

$

t = 0 | *t* = 1



	Project without flexibility	Project with flexibility	Twin security	Risk-free bond
Cash flow	150	150		
Investment	(105)	(105)		
Net cash flow	**45**	**45**	**50**	**1.05**
Cash flow	50	50		
Investment	(105)	(105)		
Net cash flow	**(55)**	**–**	**16.7**	**1.05**

Risk-free rate = 5%
WACC = 10%

Note: *t* = time, in years
p = probability

The answer changes if management has flexibility to defer the investment decision for one year, allowing it to make the decision after observing next year's mineral price and the associated cash flow outcome (see Exhibit 35.6). The net cash flows in the favorable state are \$150 – \$105 = \$45. In the unfavorable state, management would decline to invest, accepting net cash flows of \$0.

To value this flexibility, we first use an ROV approach, and then repeat the valuation with the DTA approach.

Real-Option Valuation

Option-pricing models use a *replicating portfolio* to value the project. The basic idea of a replicating portfolio is straightforward: if you can construct a portfolio of priced securities that has the same payouts as an option, the portfolio and option should have the same price. If the securities and the option are traded in an open market, this identity is required; otherwise arbitrage profits are possible. The interesting implication is that the ROV approach lets you correctly value complex, contingent cash flow patterns.

Returning to our \$105 investment project, assume there exists a perfectly correlated security (or commodity in this example) that trades in the market for \$30.30 per share (or unit).[7] Its payouts (\$50 and \$16.70) equal one-third of the payouts of the project, and its expected return equals the underlying project's cost of capital.

[7]You could also use this twin security to value the investment project without flexibility by means of a replicating portfolio. Because the twin security's cash flows are always exactly one-third of the project cash flows, the project without flexibility should be worth three times as much as the twin security, or \$90.90 (= 3 × \$30.30). The twin security is a basic concept that is implicitly used in standard DCF as well; you derive the beta of a project by identifying a highly correlated, traded security and use that security's beta as input for the cost of capital in the DCF valuation.

This twin security can be used to value the project, including the option to defer, by forming a replicating portfolio.[8] Consider a portfolio consisting of N shares of the twin security and B risk-free bonds with a face value of \$1. In the favorable state, the twin security pays \$50 for each of the N shares, and each bond pays its face value plus interest, or $(1 + r_f)$. Together, these payouts must equal \$45. Applying a similar construction to the unfavorable state, we can write two equations with two unknowns:

$$\$50.0N + \$1.05B = \$45$$
$$\$16.7N + \$1.05B = 0$$

The solution is $N = 1.35$ and $B = -21.43$. Thus, to build a replicating portfolio, buy 1.35 shares and short 21.43 bonds (shorting a bond is common language for selling a bond, or borrowing money).

This position pays off exactly the same cash flow as the investment project under both states. Therefore, the value of the project, including the ability to defer, should equal the value of the replicating portfolio:

$$\begin{aligned}\text{Contingent NPV} &= N(\text{Price of Twin Security}) - B(\$1)\\ &= 1.35(\$30.3) - 21.43(\$1)\\ &= \$19.5\end{aligned}$$

The value of the deferral option is the difference between the total contingent NPV of the project and its standard NPV without flexibility: \$19.50 – (–\$9.10) = \$28.60 (remember, the standard NPV was negative).

Contingent NPV can also be determined with an alternative ROV approach called *risk-neutral valuation.* The name is somewhat misleading because a risk-neutral valuation does adjust for risk, but as part of the scenario probabilities rather than the discount rate. To value an option, weight the future cash flows by risk-adjusted (or so-called risk-neutral) probabilities instead of the actual scenario probabilities. Then discount the probability-weighted average cash flow by the risk-free rate to determine current value. The risk-neutral probability of the favorable state, p^*, is defined as follows:[9]

$$p^* = \frac{1 + r_f - d}{u - d} = 0.45$$

[8]If the project itself were traded, you would not need a twin security but would construct a replicating portfolio with the traded value of the project itself.
[9]See, for example, Trigeorgis, *Real Options*, 75–76.

where

$$u = \frac{\text{FV(Favorable State)}}{\text{PV}} = \frac{\$50.0}{\$30.3} = 1.65$$
$$d = \frac{\text{FV(Unfavorable State)}}{\text{PV}} = \frac{\$16.7}{\$30.3} = 0.55$$

Solve by substituting:

$$p^* \quad = 0.45$$
$$1 - p^* = 0.55$$

These probabilities implicitly capture the risk premium for investments perfectly correlated with the twin security. We discount the future cash flows weighted by the risk-neutral probabilities at the risk-free rate of 5 percent, arriving at exactly the same value determined using the replicating portfolio:

$$\text{Contingent NPV} = \frac{0.45(\$45) + 0.55(0)}{1.05} = \$19.5$$

It is no coincidence that the replicating portfolio and risk-neutral valuation lead to the same result. They are mathematically equivalent, and both rely on the price of the twin security to derive the value of an investment project with an option to defer.

Valuation Based on Decision Tree Analysis

A second method for valuing a project with flexibility is to use DTA. This leads to the right answer in principle, but only if we apply the *correct* cost of capital for a project's contingent cash flows.

One DTA approach is to discount the project's contingent payoffs net of the investment requirements. Unfortunately, we can only derive the correct cost of capital for these cash flows from the ROV results. Given the project's contingent NPV of \$19.50 with equal chances of paying off \$45 or \$0, the implied discount rate from the ROV analysis is 15.5 percent.[10] This is significantly above the underlying asset's 10 percent cost of capital, because the contingent cash flows are riskier. The contingent NPV has an equal chance of increasing by 131 percent or decreasing by 100 percent. The value of the underlying asset (\$90.90) has a 50–50 chance of going up 65 percent (to \$150) or down by 45 percent

[10]In this simplified example, there is one value for the cost of capital. In general, the cost of capital for the contingent cash flows is not constant. It changes with the risk of the option across time and states of the world.

(to \$50). If the underlying asset's cost of capital of 10 percent were used, the DTA results would therefore be too high:

$$\text{Contingent NPV} = \frac{0.5(\$45) + 0.5(0)}{1.10} = \$20.5$$

A better DTA approach separately discounts the two components of the contingent cash flows. The contingent payoffs from the underlying asset are discounted at the cost of capital of the underlying asset. The investment requirements are discounted at the risk-free rate. Using this DTA approach, the valuation now comes much closer to the correct result:

$$\text{Contingent NPV} = 0.5\left(\frac{\$150}{1.10} - \frac{\$105}{1.05}\right) + 0.5(0) = \$18.2$$

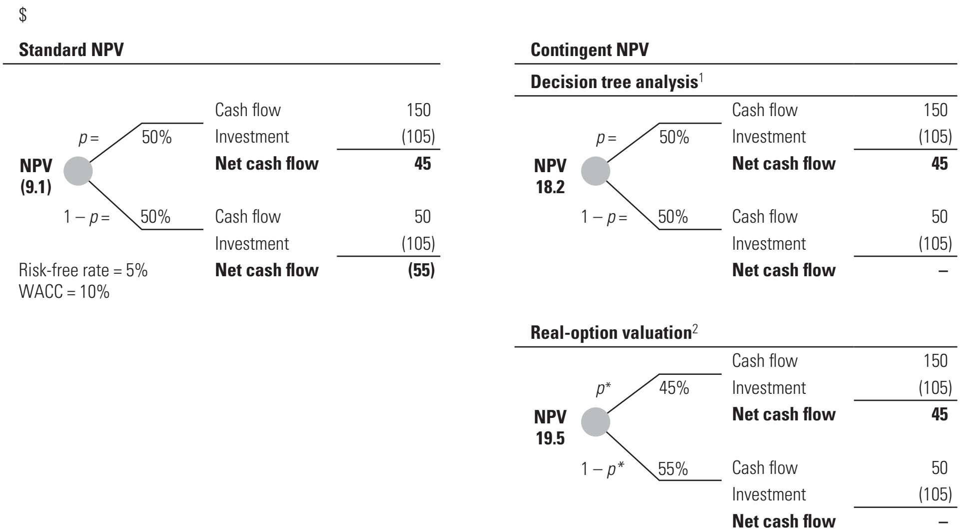
The next section discusses how this second DTA approach can lead to the exact ROV outcome if the underlying risk is either diversifiable or nondiversifiable but is too small to influence the future investment decision (that is, if the project value would exceed the investment requirements even in the unfavorable state).

Comparing ROV and DTA Approaches

As summarized in Exhibit 35.7, the standard NPV approach undervalues our mining project at –\$9.10. The ROV approach generates a correct value (NPV = \$19.50) because it captures the value of flexibility by using a replicating portfolio or risk-neutral valuation. The DTA approach could lead to the same result and at \$18.20 is actually quite close in this example, capturing almost the entire gap between the standard NPV valuation and the more granular ROV result. But the DTA results might be further off or closer to the ROV mark, depending on the project's payoffs and risks.

This example does not mean that ROV is the best approach to valuing managerial flexibility. The stylized example did not take into account two important aspects of real-life investment decisions: the type of underlying risk and the availability of data on the value and variance of cash flows from the underlying asset. Exhibit 35.8 identifies when each method is most suitable. As we explain next, ROV works best when the future cash flows are closely linked to traded commodities, securities, or currencies. Not surprisingly, real-option valuations are most often used for commodity-linked investments, such as in the mining and oil industries. In most other cases, we recommend the more straightforward DTA approach because (most of) the underlying risk is diversifiable or because only rough estimates are available for required inputs such as the underlying asset value and variance.

EXHIBIT 35.7 **Valuation Result: Standard vs. Contingent NPV**

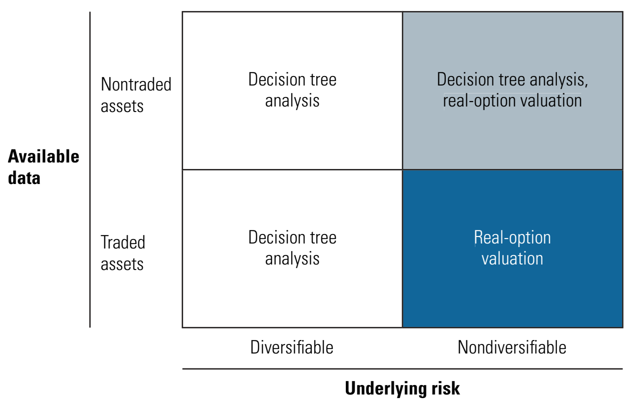


Note: t = time, in years; p = probability; p^* = binomial (risk-neutral) probability.

[1] Discounting cash flows at the project's cost of capital of 10% and investments at the risk-free rate of 5%.

[2] Using risk-neutral valuation.

EXHIBIT 35.8 **Application Opportunities for Real-Option Valuation vs. Decision Tree Analysis**



Two flavors of risk: Diversifiable and nondiversifiable Investment projects can be exposed to a wide range of risks, such as product price and demand risk, interest and currency risks, technological risk, and political risk. The question is which particular risk (or group of risks) could affect a project's cash flow to such an extent that it would change management's future decisions:

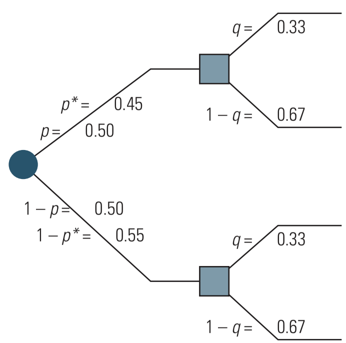
- If commodity prices (as in mining, the oil industry, or power generation) or currency and interest rates are keys to future investment decisions, the key *underlying risk is not diversifiable,* and only ROV leads to the theoretically correct valuation. This was illustrated in the previous example in this chapter, where the difference in mining payoffs stemmed from changes in the mineral price. The DTA approach could not provide a correct value, although it was quite close in that particular case.
- If technological risks (such as a drug trial outcome or geological survey result) are critical to future investment decisions, the *underlying risk is diversifiable,* and both ROV and DTA are effective tools for valuing flexibility. Applying DTA, it is possible to discount the project's payoffs in each scenario at the cost of capital of the underlying asset and discount the investment requirements at the risk-free rate (see equation in the example of the pharmaceutical drug company presented near the beginning of the chapter).[11]

Let's illustrate how you can apply ROV and DTA, depending on which group of risks dominates in a more complex version of the mining example from the previous section. In addition to price risk, there is now also uncertainty about the size of the reserves found (see Exhibit 35.9, Example 1). The mine is either very large, with reserves at 2.50 times the expected level, or very small, at 0.26 times the expected level. The probability of very large mining reserves is 33 percent, versus a probability of 67 percent for very small reserves. This implies that there are not just two but four possible outcomes to the initial investment, with cash flows ranging from \$375 in the large-mine and high-mineral-price scenario (\$150 × 2.50) to \$13 in the small-mine and low-price scenario (\$50 × 0.26). As the conditional payoffs in the exhibit reflect, the rational decision is to start production only if the mine turns out to be large, regardless of the commodity price. For a small mine, even the high-price scenario does not justify production, as the investment requirements (\$105) exceed the cash flow (\$39 = \$150 × 0.26).

To use the ROV approach to derive the valuation results, multiply the conditional payoffs by the risk-neutral (pseudo-)probabilities for the price scenarios and the normal probabilities for the quantity scenarios, and then

[11] To value the drug development project with an ROV approach, we build a replicating portfolio. Assume a twin security exists whose payoffs are perfectly correlated with the outcome of the drug trial, generating \$52.50 when the outcome is favorable and \$10.50 when it is unfavorable. Because its cash flows are driven by technological risk only, the security's market beta is zero, and its present value must be \$30. A replicating portfolio consists of a long position of 107.1 of these securities and a short position of \$1,071.40 in risk-free bonds. The ROV is therefore 107.1(\$30) – \$1,071.4(1) = \$2,143. See also Dixit and Pindyck, *Investment under Uncertainty*, 30–32, for a similar proof.

EXHIBIT 35.9 **Valuation Result for Mixed Price and Quantity Risk**



Price risk event
Quantity risk event

Example 1: High technology risk

Price	Size	Cash flow	Investment	Net cash flow	ROV	DTA
150	2.50	375	(105)	270	38.6	39.8
150	0.26	39	(105)	–	–	–
50	2.50	125	(105)	20	3.4	2.3
50	0.26	13	(105)	–	–	–
				Value	42.0	42.0

Example 2: Low technology risk

Price	Size	Cash flow	Investment	Net cash flow	ROV	DTA
150	1.50	225	(105)	120	17.1	17.3
150	0.75	113	(105)	8	2.3	0.9
50	1.50	75	(105)	–	–	–
50	0.75	38	(105)	–	–	–
				Value	19.5	18.2

discount at the risk-free rate.[12] For example, for the large-mine, high-price scenario:

$$\frac{0.45 \times 0.33 \times \$270}{1.05} = \$38.6$$

Summing these values over all possible scenarios leads to an ROV of \$42.00.[13]

Taking a DTA approach instead, we would multiply the conditional payoffs by the normal probabilities for price and quantity scenarios and then separately discount the cash inflows at the mine's cost of capital and the investment cash flow at the risk-free rate. For the large-mine, high-price scenario, for example:

$$0.50 \times 0.33 \times \left(\frac{\$375}{1.10} - \frac{\$105}{1.05}\right) = \$39.8$$

Similarly, summing the results over all scenarios, we obtain a DTA value of \$42.00, which is exactly equal to the ROV result. The reason is that the decision is driven entirely by the diversifiable, technological risk related to the size of mine. The nondiversifiable price risk leads to different cash flows but does not matter for the investment decision.[14]

The DTA and ROV approaches both provide the theoretically correct answer when the contingent decisions are (predominantly) driven by diversifiable underlying risk. Examples are geological risks, such as the size of an undeveloped oil field, and even some forms of marketing risk, such as consumer acceptance of a new product. As in the numerical illustration, these risks are sometimes more important for future investment decisions than nondiversifiable risks. For example, the driver of the decision to invest in drug development is whether the drug passes the trials, not whether the drug—once successfully developed—is worth more or less depending on general economic conditions.

In contrast, the ROV approach is theoretically correct if the contingent decision is affected by nondiversifiable risk; the DTA result would lead to an approximate result. For the same numerical illustration as before, the nondiversifiable price risk would affect the investment decision if the quantity risk would be smaller (see Exhibit 35.9, Example 2). With mine size outcomes at 1.50

[12]We can use the risk-neutral probabilities from the original example because the mineral price risk has not changed. For the quantity risk, no risk adjustment to the probabilities is needed because it is diversifiable. We used the risk-neutral probability approach for the ROV valuation because it is more straightforward to apply here; of course, the replicating portfolio approach leads to an identical value.

[13]Note that this value is higher than in the original example, because we now develop the mine only if the reserves are large—we have introduced additional flexibility.

[14]If the probability distribution of the commodity price would be continuous rather than discrete as in this example, there would always be some price outcome overturning the production decision. But the point remains that if the probability of reaching such price levels is small, the difference between the ROV and DTA outcome would be small, too.

and 0.75 times the expected size, the ROV would still value the project correctly at \$19.50, but the DTA approach would only provide an approximate value at \$18.20.[15] Similarly, for some investments, the nondiversifiable risks outweigh any technological, regulatory, or other diversifiable risks. For example, decisions to invest in the expansion of a power plant are typically driven by the difference between fuel and power prices and by overall demand for power.

Data availability: traded vs. untraded assets The results of an ROV valuation, and to a lesser extent one using DTA, critically depend on well-grounded estimates for the value and the variance of cash flows from the underlying asset.

If the estimate for the *underlying asset value* is inaccurate, the flexibility value also will be inaccurate. Returning to our first example, if we estimate incorrectly the future cash flows generated by a highly effective drug, the value of the option to defer will be inaccurate. In practice, you would have to estimate the value with a full-fledged DCF model projecting sales growth, operating margins, capital turnovers, and so on. All ROV (and DTA) approaches build on this valuation of the underlying asset.

A similar argument holds for estimates of the *variance* of the underlying asset's cash flows (called *volatility* in the option-pricing literature). Volatility can have a great impact on value, because real options typically have long lifetimes and are often at-the-money or close to it,[16] meaning the decision of whether to undertake the project is a close call.[17] Still, for many managers and practitioners, volatility remains an abstract concept: how do you reasonably estimate the range of cash flow outcomes from the sale of a product that has yet to be released?[18]

Sometimes the underlying asset value and variance can be derived from traded assets. Examples include options to shut down gas-fueled power generation, abandon a copper mine, or defer production of an oil field. In such cases, because you can estimate the key inputs with reasonable accuracy, ROV should be more accurate than DTA. When estimates for the underlying asset valuation and variance (volatility) cannot be derived from traded assets and are largely judgmental, a DTA approach is more appropriate. It is more straightforward and transparent to decision makers than the ROV approach. Transparency is

[15]For the ROV result, the present value of the large-mine and high-price scenario would now be $(0.45 \times 0.33 \times \$120)/(1 + 5\%) = \$17.1$ million. Adding this to the present value for the small-mine and high-price scenario, or $(0.45 \times 0.67 \times \$7.5)/(1 + 5\%) = \$2.3$ million, leads to total ROV of \$19.5 million when rounded.

[16]It follows from option-pricing theory that the sensitivity of option value to changes in variance (referred to as vega) increases as the option's lifetime increases and as the option is closer to the money. An option is at-the-money if its exercise price equals the value of the underlying asset.

[17]If the investment decision were a clear go or no-go, there would be little value in flexibility in the first place, and no need to consider the option value.

[18]The range needs to include the associated probabilities to provide a variance estimate.

especially important when critical valuation assumptions require the decision maker's judgment. DTA captures the essence of flexibility value, and the theoretical advantage of ROV is less important if required inputs are unavailable.

FOUR STEPS TO VALUING FLEXIBILITY

To value flexibility, use the four-step process illustrated in Exhibit 35.10. In step 1, conduct a valuation of the investment project without flexibility, using a traditional discounted-cash-flow model. In step 2, expand the DCF model into an event tree, mapping how the value of the project evolves over time, using unadjusted probabilities and the weighted average cost of capital. At this stage, the model does not include flexibility, so the present value of the project, based on discounting the cash flows in the event tree, should equal the standard DCF value from the first step.

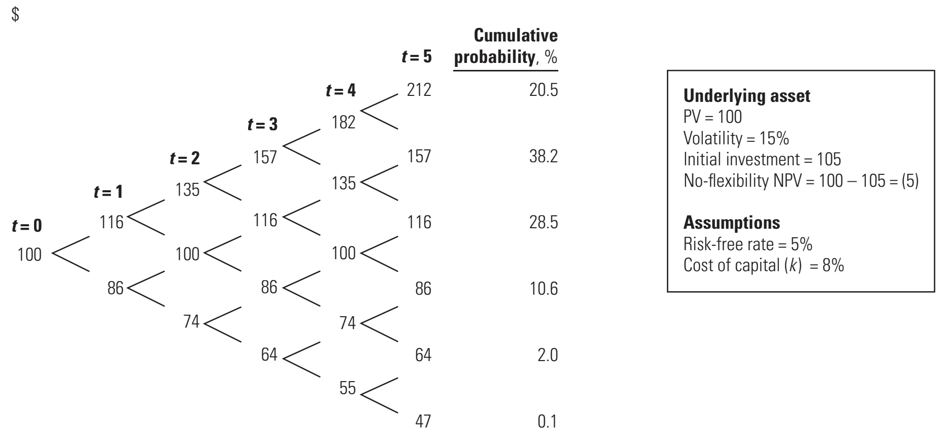
In step 3, turn the event tree into a decision tree by identifying the types of managerial flexibility that are available. Build the flexibility into the nodes of the tree. Multiple sources of flexibility are possible at a single decision node, such as the option to abandon or expand, but it is important to have clear priorities among them. Be careful in establishing the sequence of decisions regarding flexibility, especially when the decision tree has compound options.

Finally, step 4 entails recognizing how the exercise of flexibility alters the project's risk characteristics. If (most of) the risk driving the contingent cash flows is fully diversifiable, you need no special modeling and can use DTA, discounting investment cash flows at the risk-free rate and the underlying project's cash flows at the weighted average cost of capital, as in the pharmaceutical example in the next section. If the risk is (mostly) nondiversifiable and priced in the market, the appropriate risk-adjusted discount rate for the project's cash flows is no longer the weighted average cost of capital used in

EXHIBIT 35.10 **Four-Step Process for Valuing Flexibility**

	Estimate NPV without flexibility	**Model uncertainty in event tree**	**Model flexibility in decision tree**	**Estimate contingent NPV**
Objectives	Compute base-case present value without flexibility.	Understand how present value develops with respect to changing uncertainty.	Analyze event tree to identify and incorporate managerial flexibility to respond to new information.	Value total project using DTA or ROV approach.
Comments	Standard NPV approach used for valuation of underlying asset.	No flexibility modeled; valuation following event tree should equal standard NPV.	Flexibility is incorporated into event tree, transforming it into decision tree.	Under high uncertainty and managerial flexibility, contingent NPV will be significantly higher than standard NPV.

EXHIBIT 35.11 **Event Tree: Factory without Flexibility**



step 1. In that case, use an ROV approach for the project with flexibility, using a replicating portfolio or risk-neutral valuation.

Real-Option Valuation: A Numerical Example

Using the four-step process, we illustrate the ROV approach with a straightforward binomial lattice for valuing flexibility that is assumed to be driven by nondiversifiable risk. The results are identical to alternative option-pricing models that use more complicated mathematics such as stochastic calculus or Monte Carlo simulation.

Step 1: Estimate net present value without flexibility Assume that an investment in a project to build a factory generates cash flows whose present value (PV) equals \$100, with volatility of 15 percent per year.[19] Its expected rate of return and cost of capital (k) equal 8 percent. The risk-free rate is 5 percent per year, and the cash outflow necessary to undertake the project, if we invest in it immediately, is \$105. Thus, the standard NPV is –\$5, and we would not undertake the project if we had to commit today.

Step 2: Model uncertainty using event tree The lattice that models the potential values of the underlying risky asset is called an event tree. It contains no decision nodes and simply models the evolution of the underlying asset. Exhibit 35.11 illustrates potential values the factory might take for each of the next five years. Defining T as the number of years per upward movement and

[19] The standard deviation of the rate of change of the factory value.

σ as the annualized volatility of the underlying factory value, determine the up-and-down movements by using the following formulas:[20]

$$\text{Up Movement} \quad = u = e^{\sigma\sqrt{T}}$$
$$\text{Down Movement} = d = \frac{1}{u}$$

Substitute numerical values into these formulas:

$$u = e^{0.15\sqrt{1}} = 1.1618$$
$$d = \frac{1}{1.1618} = 0.8607$$

Based on traditional DCF using an 8 percent cost of capital, the probability of an up movement is 72.82 percent, and the probability of a down movement is 27.18 percent.[21] As can be verified, the present value of any branch in the event tree equals the expected payout discounted at the 8 percent cost of capital. For example, take the uppermost branch in the fifth time period. Its present value is:

$$\text{PV}_{t=4} = \frac{E(\text{PV}_{t=5})}{(1+k)} = \frac{0.7282(\$211.7) + 0.2718(\$156.8)}{1.08} = \$182.2$$

A similar calculation will produce any of the values in the event tree, resulting in a PV of the project of \$100 at $t = 0$. That present value equals the result in step 1, so we know the tree is correct.

Step 3: Model flexibility using a decision tree When you add decision points to an event tree, it becomes a decision tree. Suppose the factory can be expanded for an additional \$15. The expansion increases the factory's value at that node by 20 percent. The option can be exercised at any time during the next five years.

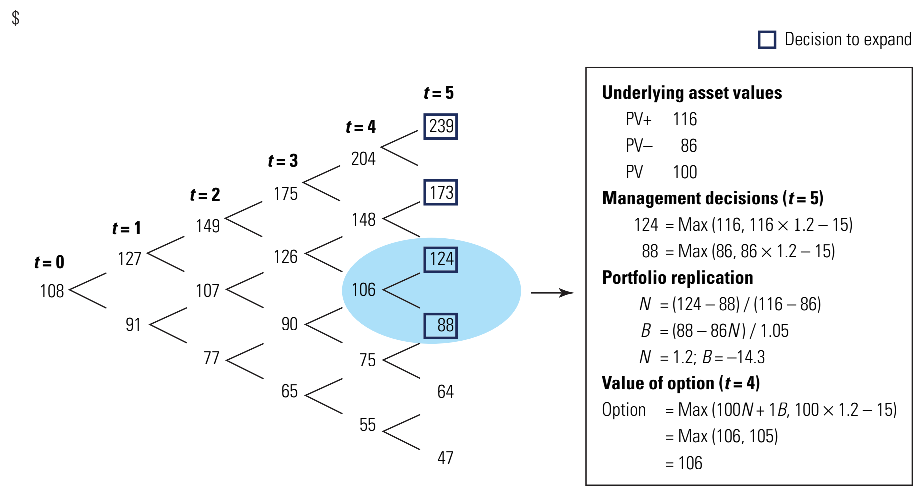
Exhibit 35.12 shows the resulting decision tree. To find the payouts at a given point on the tree, start with the final branches and work backward through time. Consider the uppermost branch in period 5. On the upward limb, the payout absent expansion would be \$211.70, but with expansion, it is 1.20 × \$211.70 – \$15 = \$239.00. Since the value with expansion is higher, we

[20] J. Cox, M. Rubinstein, and S. Ross, "Option Pricing: A Simplified Approach," *Journal of Financial Economics* 7, no. 3 (1979): 229–263. As T becomes smaller, the binomial lattice results converge to the true value of the option. In this example, we have chosen $T = 1$ for ease of illustration.

[21] See the previous note for the derivation of the formula for estimating the upward probability:

$$\frac{(1+k)^T - d}{u - d} = \frac{(1+8\%) - 0.8607}{1.1618 - 0.8607} = 0.7282$$

EXHIBIT 35.12 **Decision Tree: Option to Expand Factory**



Note: t = time, in years
PV = present value
N = number of replicating securities
B = number of risk-free bonds

Incremental investment: $15
Incremental payoff: 20%

would decide to expand. On the lower limb of that same node, the payout with expansion is 1.20 × \$156.80 – \$15 = \$173.20, versus \$156.80 without expansion, so again we would expand.

Step 4: Estimate contingent net present value To determine the value of the project with the flexibility to expand, work backward through the decision tree, using the replicating-portfolio method at each node. For the node highlighted in Exhibit 35.12, you can replicate the payoffs from the option to expand, using a portfolio of N units of the underlying project and B units of \$1 risk-free bonds:[22]

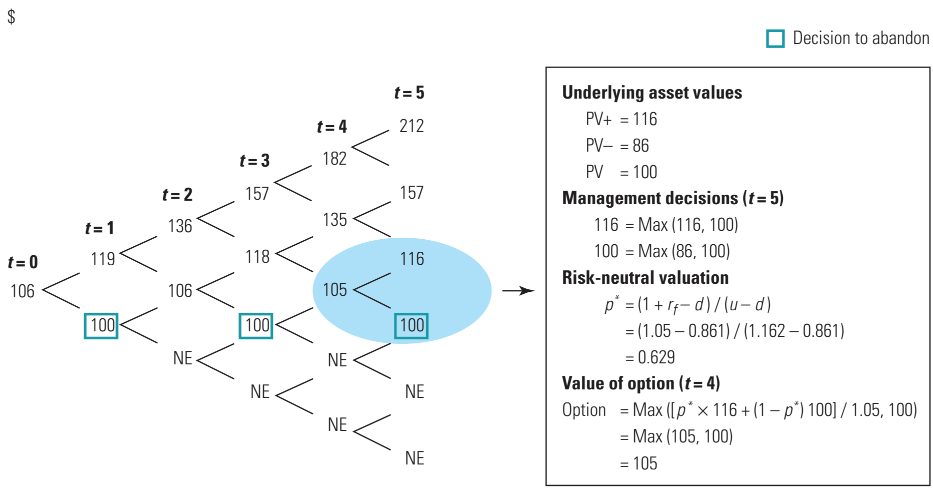
$$\$116.2N + \$1.05B = \$124.4$$

$$\$86.1N + \$1.05B = \$88.3$$

Solving the equations, we find that $N = 1.2$, and $B = -14.3$. Therefore, a replicating portfolio consists of 1.2 units of the project without flexibility (at that node, valued at \$100 in the event tree of Exhibit 35.11), plus a short position

[22]If the project itself is not traded but a traded twin security exists, we can construct the portfolio in a similar way with units of the twin security and risk-free bonds.

EXHIBIT 35.13 **Decision Tree: Option to Abandon Factory**



Note: NE = nonexisting state
t = time, in years
PV = present value
p^* = binomial (risk-neutral) probability
u = upward movement of value
d = downward movement of value
r_f = risk-free rate
Liquidation value: $100

of 14.3 bonds worth $1. As shown in the calculations in Exhibit 35.12, the value of the option is then:

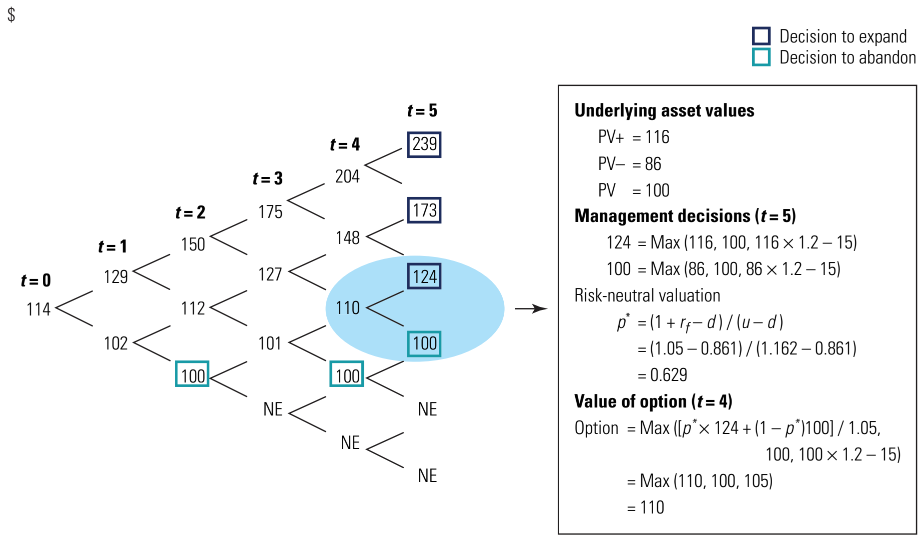
$$PV = \$100N + \$1B = \$105.7$$

Work backward from right to left, node by node, to obtain a present value of $108.40 for a project that has an option to expand. As a result, the net present value of the project increases from –$5.00 to $3.40, so the option itself is worth $8.40. Note that the analysis also provides the value-maximizing decision strategy: management should expand the factory only after five years and only if the factory is worth $75 or more.[23]

If, instead, management had the option to abandon the factory at any node for a fixed liquidation value of $100, the valuation would be as shown in Exhibit 35.13. Again, work from right to left through the decision tree. For the highlighted node, the value of the underlying factory is $116.20 in the upward

[23] This is analogous to a call option on a stock that does not pay dividends: it is never exercised prematurely. For example, in the node highlighted in Exhibit 35.12, the value in year 4 of deferring the expansion of the factory to year 5 is $105.70, as calculated in the preceding equation. The value of expanding in year 4 is $100 × 1.20 – $15 = $105. It is therefore optimal to defer expansion, as is the case for all nodes before year 5.

EXHIBIT 35.14 **Decision Tree: Option to Expand or Abandon Factory**



Note: NE = nonexisting state
t = time, in years
PV = present value
p^* = binomial (risk-neutral) probability
u = upward movement of value
d = downward movement of value
r_f = risk-free rate

Liquidation value: $100
Incremental investment: $15
Incremental payoff: 20%

branch and $86.10 in the downward branch (see in the event tree of Exhibit 35.11). Given the ability to do so, the company would abandon the project for $100 in the downward branch, so the payoffs in the decision tree are $116.20 in the upward branch and $100 in the downward branch. Using risk-neutral valuation this time, the abandonment option can be valued in this node at $104.90, as shown in Exhibit 35.13 (the same result a replicating portfolio would have generated). Working backward through time, the value for a factory with the ability to abandon is $106.40, so that the abandonment option is worth $6.40. Now the value-maximizing decision strategy is to abandon the factory immediately in any year in which its value drops below $100.

Multiple sources of flexibility can be combined within a single decision tree, as illustrated in Exhibit 35.14, using risk-neutral valuation. The value of the project, including the options to abandon and expand, would be $113.50 rather than $100, its stand-alone value without flexibility. With these options, the correct decision would be to accept the project. Note that the value of the combined expansion-abandonment flexibility, $13.50, is less than the sum of the individual flexibility values ($8.40 + $6.40 = $14.80) but greater than either of them individually. The values of both options are not additive, because they interact in complex ways (for example, you cannot expand the factory once you have abandoned it). As indicated in Exhibit 35.14, the best decision strategy is to abandon the factory whenever its value drops below $100 and to expand only in year 5 if its value exceeds $75.

REAL-OPTION VALUATION AND DECISION TREE ANALYSIS: A NUMERICAL EXAMPLE

Our next example applies both the DTA and the ROV approaches in the valuation of a research and development project. Assume a company needs to decide whether to develop a new pharmaceutical drug. In our simplified example,[24] the first step in development is a research phase of three years, in which the most promising chemical compounds are selected. The probability of success in the research phase is estimated at 15 percent. This is followed by a three-year testing phase, during which the compounds are tested in laboratory and clinical settings. The chance of successfully completing the testing phase is 40 percent. If there are successful results, the drug can be released in the market. On failure in any phase, the company terminates development, and the product dies worthless.

DTA Approach: Technological Risk

The DTA approach presented next follows the four steps for the valuation of flexibility as described in the previous section. In the DTA valuation of the research and development project, we consider only the underlying technological risk relating to the research and testing outcomes. The commercial risk concerning the future profitability of the drug and the technological risk are jointly taken into account in the ROV approach discussed in the next section.

Step 1: Estimate present value without flexibility If the development process succeeds, the drug will deliver substantial value in six years' time. Margins in the pharmaceutical industry are high because patents protect drugs against competition. A successful drug is expected to generate annual sales of $2,925 million and 45 percent earnings before interest, taxes, depreciation, and amortization (EBITDA) margin on sales until its patent expires, 10 years after its market launch. (Because prices decline drastically after a patent expires, we do not count proceeds beyond that time.) Assuming a 30 percent tax rate and a 7 percent cost of capital, a marketable drug's present value at the launch date

[24] Pharmaceutical R&D is much more complex and consists of more phases than shown in this example. For a more extensive example of valuing flexibility in pharmaceutical research and development, see Kellog and Charnes, "Real-Options Valuation for a Biotechnology Company."

would therefore be \$6,475 million. Unfortunately, the odds of successful development are small. The cumulative probability of success over the research and testing phase is only 6 percent (0.15 for research × 0.40 for testing). In addition, the investments needed to develop, test, and market a drug are high: \$100 million in the research phase, \$250 million in the testing phase, and \$150 million in marketing.

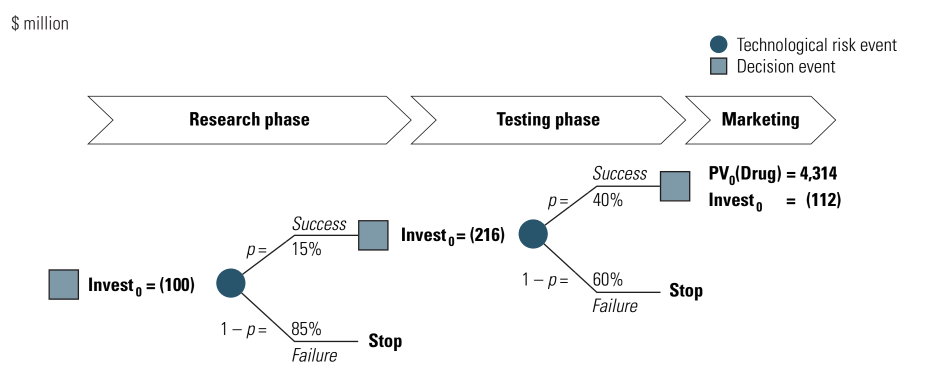
If we had to commit to all three investments today, we should not proceed, because the NPV would be negative:

$$\begin{aligned}\text{Standard NPV} &= \text{PV(Expected Cash Flows)} - \text{PV(Investments)}\\ &= 0.06\left[\frac{\$6,475}{(1.07)^6}\right] - \$100 - \frac{\$250}{(1.05)^3} - \frac{\$150}{(1.05)^6}\\ &= -\$169\end{aligned}$$

However, if we take into account management's ability to abandon the project before completion, the value is significantly higher.

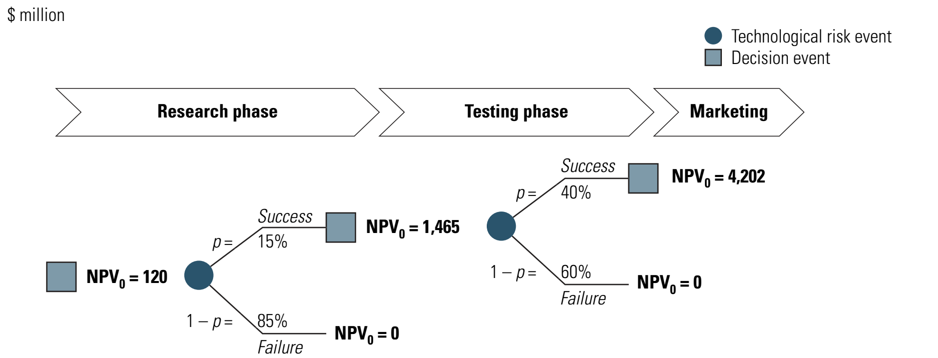
Step 2: Model uncertainty using an event tree In this development project, a key source of risk behind the diverging contingent cash flows is technological risk relating to the research and testing outcomes. You can model this uncertainty using a straightforward event tree (see Exhibit 35.15). Note that the tree shows all cash inflows and outflows at values discounted to today. For example, the expected value of a marketable drug after six years is shown at its present value as of today (t = 0) of \$4,314 million (which equals the drug's value at launch of \$6,475 discounted over six years at 7 percent). Since the

EXHIBIT 35.15 **Event Tree: R&D Option with Technological Risk**



Note: PV_0(Drug) = present value of marketable drug discounted to t = 0 at WACC
$Invest_0$ = investment discounted to t = 0 at risk-free rate
p = probability of technological success

EXHIBIT 35.16 **Decision Tree: R&D Option with Technological Risk**



Note: NPV_0 = net present value of development project discounted to $t = 0$
p = probability of technological success

investment outlays are certain, they are discounted at the risk-free rate of 5 percent.[25]

Step 3: Model flexibility using a decision tree Next, include decision flexibility in the tree, working from right to left. At the end of the testing phase, we have the option to invest \$150 million in marketing, which equals \$112 million in today's dollars. We should invest only if testing has produced a marketable product. At the end of the research phase, we have the option to proceed with the testing phase. If the research phase fails, there is no point in proceeding, and if it is successful, we will proceed to testing only if the payoffs justify the incremental investment of \$250 million (or \$216 million discounted to today at the risk-free rate).

Step 4: Estimate value of flexibility Because the technological risk is fully diversifiable, apply a DTA approach for the valuation of flexibility. Again, work from right to left in the tree (see Exhibit 35.16). At the end of the testing phase, we proceed with launching the product only if there is a marketable product. The value in millions at this point in time is therefore Max[(\$4,314 – \$112), 0] = \$4,202. The value of the option to proceed at the end of the research phase is calculated as follows:

$$\text{PV(Option)} = \text{Max}[\text{PV(Testing)} - \text{Inv(Testing)}, 0]$$

[25]The assumption to discount investment outlays at the risk-free rate is also implicitly made in the ROV approach.

In this equation, PV(Testing) is the present value of proceeding with testing, which equals the probability-weighted future payoffs:

$$\text{PV(Testing)} = 0.40(\$4{,}202) + 0.60(0) = \$1{,}681$$

Inv(Testing) is the investment requirement for the testing phase, which in millions equals \$250 or \$216 discounted to $t = 0$. Substituting, find the present value of the development project prior to the testing phase:

$$\text{PV(Option)} = \text{Max}[(\$1{,}681 - \$216), 0] = \$1{,}465$$

These amounts need not be discounted further, because they already represent present value as of $t = 0$.

Working farther from right to left in the tree, we find the contingent NPV for the entire development project prior to the research phase:

$$\begin{aligned}\text{PV(Option)} &= \text{Max}[\text{PV(Research)} - \text{Inv(Research)}, 0]\\ &= \text{Max}\,[0.15(\$1{,}465) + 0.85(0) - \$100, 0]\\ &= \$120\end{aligned}$$

This value including flexibility is significantly higher than the standard NPV of –\$169 million.

ROV Approach: Technological and Commercial Risk

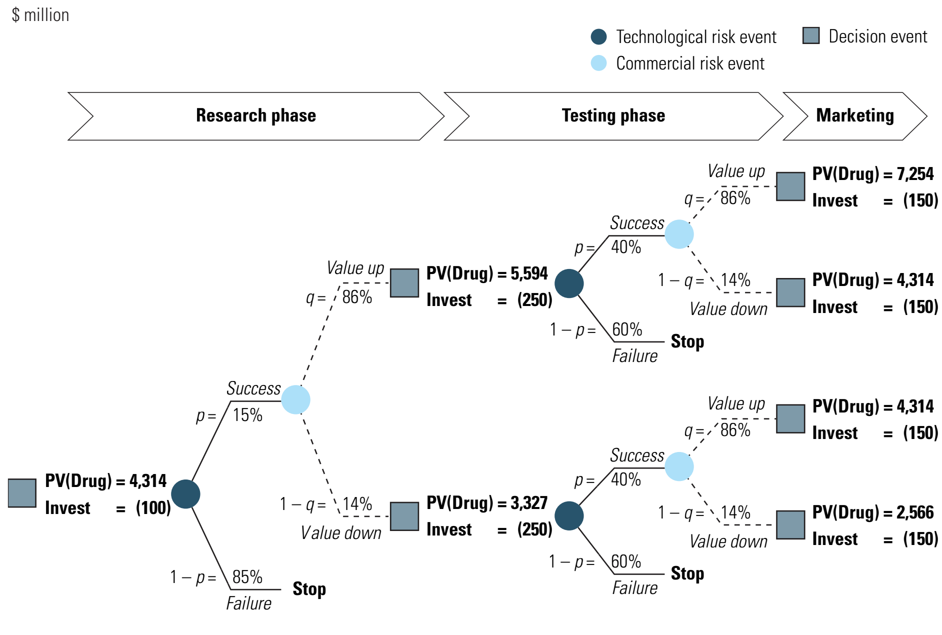
Our analysis thus far did not include the other source of uncertainty in the development project: the commercial risk concerning the future cash-flow potential of the successfully developed and marketed drug. ROV is necessary to handle both technological and commercial risk.

Step 1: Estimate present value without flexibility The first step, estimating present value without flexibility, is identical for the DTA and ROV approaches.

Step 2: Model uncertainty using an event tree Both risks can be modeled in a combined event tree (see Exhibit 35.17). In contrast to the event tree in the DTA approach, the amounts in this tree do not represent present values but rather future values that will need to be discounted when you solve for the value of the option. For simplicity, we have chosen a one-step binomial lattice to describe the evolution of the drug value over each three-year period.[26]

[26]With more nodes, the tree quickly becomes too complex to show in an exhibit, because it does not converge in the technological risk. We carried out the analysis with 10 nodes and found that doing so did not affect the results for this particular example.

EXHIBIT 35.17 **Event Tree: R&D Option with Technological and Commercial Risk**



Note: PV(Drug) = present value of marketable drug
Invest = investment
p = probability of technological success
q = probability of drug value increase

Assuming an annual volatility of 15 percent, we can derive the upward and downward movements, u and d, as follows:

$$u = e^{\sigma\sqrt{T}} = e^{0.15\sqrt{3}} = 1.30$$

$$d = \frac{1}{u} = \frac{1}{1.30} = 0.77$$

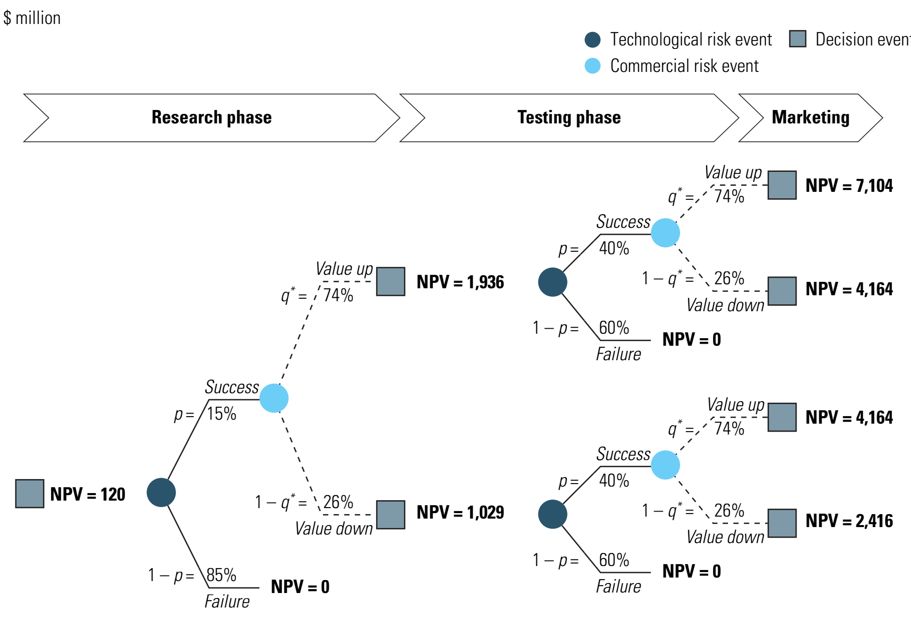
The probability of an upward movement is 86 percent, and the probability of a downward movement is 14 percent.[27] The value of a marketable drug at the start of the research phase is $4,314 million. At the end of the research phase, there are three possible outcomes: success combined with an increase in the value of a marketable drug to $5,594 million, success combined with a decrease

[27]The formula for estimating the upward probability is:

$$\frac{(1+k)^T - d}{u - d} = \frac{1.07^3 - 0.77}{1.30 - 0.77} = 0.86$$

where k is the expected return on the asset.

EXHIBIT 35.18 **Decision Tree: R&D Option with Technological and Commercial Risk**



Note: NPV = net present value of project
q^* = binomial (risk-neutral) probability of an increase in marketable drug value
p = probability of technological success

in the value of a marketable drug to $3,327 million, and failure leading to a drug value of $0. Following the same logic, there are six possible outcomes after the testing phase.

Step 3: Model flexibility using a decision tree The logic underlying the decision tree including commercial risk (see Exhibit 35.18) is the same as under the DTA approach. For example, the payoff at the end of the testing phase in the top branch equals Max[($7,254 – $150), 0] = $7,104. The primary difference is that the ROV version of the tree recognizes the ability to abandon development if the value of a marketable drug drops too much.

Step 4: Estimate contingent NPV The commercial risk regarding the drug's future cash flows is not diversifiable,[28] so you need to use an ROV approach to

[28]Recall that we assumed the cost of capital for a marketed drug is 7 percent. Given our assumption for a risk-free rate of 5 percent, its beta must be different from zero.

include it in your valuation. This example uses risk-neutral valuation. Therefore, risk-adjust all probabilities of the upward and downward movements for the drug's value:

$$p^* = \frac{(1+r_f)^T - d}{u-d} = \frac{1.05^3 - 0.77}{1.30 - 0.77} = 0.74$$

Having applied the risk-neutral probabilities, discount all contingent payoffs at the risk-free rate, working from right to left in the tree. Because the technological risk is fully diversifiable, there is no need to adjust the probabilities for success and failure in research or testing.

For example, from Exhibit 35.18, the value of the option at the end of a research phase showing a drop in the value of the drug is expressed as follows:

$$\text{PV(Option)} = \text{Max}[\text{PV(Testing)} - \text{Inv(Testing)}, 0]$$

In this equation, PV(Testing) represents the value of proceeding with testing at this node. It equals the value of the future payoffs weighted by risk-neutral probabilities and discounted at the risk-free rate:

$$\text{PV(Testing)} = \frac{0.40[0.74(\$4,164) + 0.26(\$2,416)] + 0.60(0)}{(1.05)^3} = \$1,279$$

Inv(Testing) equals \$250 million, so the value of the development project at this node is as follows:

$$\text{PV(Option)} = \text{Max}[(\$1,279 - \$250), 0] = \$1{,}029$$

Solve for the other nodes in the same way. Working backward through the tree, the contingent NPV is estimated at \$120 million, the same result as obtained in the DTA approach without commercial risk.

This is not surprising. A closer look at the decision tree reveals that uncertainty about the future value of the drug if it is marketable is not significant enough to influence any of the decisions in the development process. In this example, the commercial risk makes no difference, even if we assume volatility as high as 50 percent (an amount that exceeds the volatility of many high-tech stocks). As noted earlier, when nondiversifiable risk (the drug's commercial risk as measured by its beta) does not influence investment decisions, the DTA and ROV results are equivalent.

Moreover, in real situations, the key uncertainty in drug development is whether the drug proves to be an effective disease treatment without serious side effects. The commercial risk is far less relevant, because a truly effective drug almost always generates attractive margins. The example illustrates how in such cases it is more practical to focus on the technological risk entirely, using a DTA approach. Explicitly modeling the nondiversifiable (e.g., commercial) risk requires an ROV approach that is more complex and may not even affect the valuation results.

In general, when faced with multiple sources of underlying risk, carefully assess whether all of these possible risks are important or whether one dominates all others. Sometimes you can focus the valuation approach on just one or two sources of uncertainty and greatly simplify the analysis.

SUMMARY

Managerial flexibility lets managers defer or change investment decisions as a business or project develops. Clearly, it can alter the value of the business or project substantially. Rigid use of standard DCF analysis fails to account for the impact that exercising flexibility has on present value.

Flexibility comes in many forms, such as the option to defer, expand, contract, or abandon projects or switch them on and off; this chapter has illustrated only a few applications. Contingent NPV analysis, in the form of decision tree analysis (DTA) or real-option valuation (ROV) models, correctly captures flexibility's impact on value. Although the ROV approach is theoretically superior to DTA, applying it is more complex. So ROV is often limited to valuing flexibility in commodity-based industries where commodity prices are measurable, making its application more straightforward. In most other cases, a careful DTA approach delivers results that are reasonably solid and can provide more valuable insights.

APPENDIX A

Discounted Economic Profit Equals Discounted Free Cash Flow

This appendix demonstrates the equivalence between discounted cash flow and discounted economic profit algebraically. In the first section, we convert the key value driver formula presented in Chapter 2 into a value driver formula based on economic profit. This formula is used in Chapter 8 to estimate continuing value in the economic-profit valuation. The second section of this appendix generalizes the proof to any set of cash flows.

PROOF USING PERPETUITIES

To convert the key value driver formula into an economic-profit-based formula, start with the growing cash flow perpetuity:

$$V = \frac{\text{FCF}_{t=1}}{\text{WACC} - g}$$

where V = value of operations
$\text{FCF}_{t=1}$ = free cash flow in year 1
WACC = weighted average cost of capital
g = growth in NOPLAT and free cash flow

In Chapter 2, we converted the growing perpetuity into the key value driver formula:

$$V = \frac{\text{NOPLAT}_{t=1}\left(1 - \frac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

where $NOPLAT_{t=1}$ = net operating profit less adjusted taxes in year 1
RONIC = return on new invested capital

The key value driver formula can be rearranged further into a formula based on economic profit. We do this to demonstrate that discounted cash flow is equivalent to the current book value of invested capital plus the present value of future economic profits. By definition, invested capital times return on invested capital (ROIC) equals NOPLAT at time 1. Thus, replace NOPLAT with invested capital times ROIC:

$$V = \frac{\text{Invested Capital}_0 \times \text{ROIC} \times \left(1 - \dfrac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

If we assume that the return on new invested capital (RONIC) equals the return on existing invested capital (ROIC), it is possible to simplify the preceding equation by distributing ROIC in the numerator:[1]

$$V = \text{Invested Capital}_0 \left(\frac{\text{ROIC} - g}{\text{WACC} - g}\right)$$

To complete the transformation to economic profit, next add and subtract WACC in the numerator:

$$V = \text{Invested Capital}_0 \left(\frac{\text{ROIC} - \text{WACC} + \text{WACC} - g}{\text{WACC} - g}\right)$$

Separate the fraction into two components and then simplify:

$$\begin{aligned} V &= \text{Invested Capital}_0 \left(\frac{\text{ROIC} - \text{WACC}}{\text{WACC} - g}\right) + \text{Invested Capital}_0 \left(\frac{\text{WACC} - g}{\text{WACC} - g}\right) \\ &= \text{Invested Capital}_0 + \frac{\text{Invested Capital}_0\,(\text{ROIC} - \text{WACC})}{\text{WACC} - g} \end{aligned}$$

[1] This equation shows two requirements for using the key value driver formula: both WACC and ROIC must be greater than the rate of growth in cash flows. If WACC is less than the cash flow growth rate, cash flows grow faster than they can be discounted, and value approaches infinity. (Perpetuity-based formulas should never be used to value cash flows whose growth rates exceed WACC.) If ROIC is lower than the growth rate, cash flows are negative, producing a negative value. In actuality, this situation is unlikely; investors would not finance a company that is never expected to return positive cash flow.

Economic profit is defined as invested capital times the difference of ROIC minus WACC. Substituting this definition into the previous equation leads to our final equation:

$$V = \text{Invested Capital}_0 + \frac{\text{Economic Profit}_1}{\text{WACC} - g}$$

According to this formula, a company's operating value equals the book value of its invested capital plus the present value of all future economic profits. (The final term is a growing perpetuity of economic profits.) If future economic profits are expected to be zero, the intrinsic value of a company equals its book value. In addition, if future economic profits are expected to be less than zero, then enterprise value should trade at less than the book value of invested capital—an occurrence observed in practice.

GENERALIZED PROOF

The previous section limited our proof to a set of cash flows growing at a constant rate. This section generalizes the proof to any set of cash flows. To demonstrate equivalence, start by computing the present value of a periodic stream of cash flows:

$$V = \sum_{t=1}^{\infty} \frac{\text{FCF}_t}{(1 + \text{WACC})^t}$$

where V = value of operations
FCF_t = free cash flow in year t
WACC = weighted average cost of capital

To this value, add and subtract the cumulative sum of all current and future amounts of invested capital (IC):

$$V = \sum_{t=0}^{\infty} \frac{\text{IC}_t}{(1 + \text{WACC})^t} - \sum_{t=0}^{\infty} \frac{\text{IC}_t}{(1 + \text{WACC})^t} + \sum_{t=1}^{\infty} \frac{\text{FCF}_t}{(1 + \text{WACC})^t}$$

where IC_t = invested capital for year t.

Next, adjust the preceding equation slightly to restate the same value into terms that can be canceled later. First, strip invested capital at time zero from the first cumulative sum. Then modify the second cumulative sum to $t = 1$ to infinity, by changing each t inside the second cumulative sum to $t - 1$. This new representation is identical to the original representation but will allow us to cancel terms later. The new representation is as follows:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{IC_t}{(1 + WACC)^t} - \sum_{t=1}^{\infty} \frac{IC_{t-1}}{(1 + WACC)^{t-1}} + \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}$$

Multiply the second cumulative sum by (1 + WACC)/(1 + WACC). This action converts the exponent $t - 1$ in the denominator of the cumulative sum to t. Also substitute for free cash flow in the third cumulative sum, using its definition, NOPLAT less the increase in invested capital:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{IC_t}{(1 + WACC)^t} - \sum_{t=1}^{\infty} \frac{(1 + WACC)IC_{t-1}}{(1 + WACC)^t} + \sum_{t=1}^{\infty} \frac{NOPLAT_t - (IC_t - IC_{t-1})}{(1 + WACC)^t}$$

Because there is now a consistent denominator across all three cumulative sums, combine them into a single cumulative sum:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{IC_t - (1 + WACC)IC_{t-1} + NOPLAT_t - IC_t + IC_{t-1}}{(1 + WACC)^t}$$

In the second term of the numerator, distribute $(1 + WACC)IC_{t-1}$ into its two components, IC_{t-1} and $WACC(IC_{t-1})$:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{IC_t - IC_{t-1} - WACC(IC_{t-1}) + NOPLAT_t - IC_t + IC_{t-1}}{(1 + WACC)^t}$$

Simplify by collecting terms:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{NOPLAT_t - WACC(IC_{t-1})}{(1 + WACC)^t}$$

The numerator is the definition of economic profit, so the result is a valuation based on economic profit:

$$V = IC_0 + \sum_{t=1}^{\infty} \frac{\text{Economic Profit}_t}{(1 + WACC)^t}$$

The enterprise value of a company equals the book value of its invested capital plus the present value of all future economic profits. To calculate the value correctly, you must calculate economic profit using last year's (i.e., the beginning-of-year) invested capital—a subtle but important distinction.

The interdependence of invested capital, economic profit, and free cash flow is not surprising. Think of discounted cash flow this way: A portion of future cash flows is required to cover the required return for the investor's capital. The remaining cash flow is either used to grow invested capital (to generate additional future cash flows) or returned to investors as an extra bonus. This bonus is valuable, so investors are willing to pay a premium for cash flows above the amount required. Subsequently, companies with positive economic profits will trade at a premium to the book value of invested capital.

APPENDIX B

Derivation of Free Cash Flow, Weighted Average Cost of Capital, and Adjusted Present Value

Chapter 8 demonstrated numerically the equivalence of enterprise discounted cash flow (DCF), adjusted present value (APV), and the cash-flow-to-equity valuation when leverage (as measured by the market-based debt-to-equity ratio) is constant. This appendix derives the key terms in each model—namely, free cash flow (FCF) and the weighted average cost of capital (WACC)—and demonstrates their equivalence algebraically.

To simplify the analysis, we assume cash flows to equity are growing at a constant rate, g. This way we can use growth perpetuities to analyze the relationship between methods.[1]

ENTERPRISE DISCOUNTED CASH FLOW

By definition, enterprise value equals the market value of debt plus the market value of equity:

$$V = D + E$$

[1]For an analysis that applies to more complex situations (i.e., when cash flows can follow any pattern), see J. A. Miles and J. R. Ezzell, "The Weighted Average Cost of Capital, Perfect Capital Markets, and Project Life: A Clarification," *Journal of Financial and Quantitative Analysis* 15 (1980): 719–730 (for a discussion of enterprise DCF and WACC); and S. C. Myers, "Interactions of Corporate Financing and Investment Decisions: Implications for Capital Budgeting," *Journal of Finance* 29 (1974): 1–25 (for a discussion of adjusted present value).

To examine the components of enterprise value, multiply the right side of the equation by a complex fraction equivalent to 1 (the numerator equals the denominator, an algebraic trick we will use many times):

$$V = (D + E)\left(\frac{D(1 - T_m)k_d + \mathrm{CF}_e - D(g)}{D(1 - T_m)k_d + \mathrm{CF}_e - D(g)}\right) \tag{B.1}$$

where T_m = marginal tax rate
k_d = cost of debt
CF_e = cash flow to equity holders
g = growth in cash flow to equity holders

Over the next few steps, the fraction's numerator will be converted to free cash flow (FCF). We will show later that the denominator equals the weighted average cost of capital. Start by defining FCF:

$$\mathrm{FCF} = D(1 - T_m)k_d + \mathrm{CF}_e - D(g)$$

If the market value of debt equals the face value of debt, the cost of debt will equal the coupon rate, and D times k_d will equal the company's interest expense. Therefore,

$$\mathrm{FCF} = \mathrm{Interest}(1 - T_m) + \mathrm{CF}_e - D(g)$$

By definition, cash flow to equity (CF_e) equals earnings before interest and taxes (EBIT) minus interest minus taxes minus net investment plus the increase in debt. Assuming the ratio of debt to equity is constant, the annual increase in debt will equal $D(g)$. Why? Since cash flows to equity are growing at g, the value of equity also grows at g. Since the ratio of debt to equity remains constant (a key assumption), the value of debt must also grow at g. Substitute the definition of cash flow to equity into the preceding equation:

$$\begin{aligned}\mathrm{FCF} = {} & \mathrm{Interest}(1 - T_m) + \mathrm{EBIT} - \mathrm{Interest} - \mathrm{Taxes} \\ & - \mathrm{Net\ Investment} + D(g) - D(g)\end{aligned}$$

Next, distribute the after-tax interest expression into its two components, and cancel $D(g)$:

$$\mathrm{FCF} = \mathrm{Interest} - T_m(\mathrm{Interest}) + \mathrm{EBIT} - \mathrm{Interest} - \mathrm{Taxes} - \mathrm{Net\ Investment}$$

Simplify by canceling the interest terms and rearranging the remaining terms:

$$\mathrm{FCF} = \mathrm{EBIT} - [\mathrm{Taxes} + T_m(\mathrm{Interest})] - \mathrm{Net\ Investment}$$

Chapter 9 defines operating taxes as the taxes a company would pay if the company were financed entirely with equity. Operating taxes therefore equal reported taxes plus the interest tax shield (as interest is eliminated, taxes would rise by the interest tax shield). This leads to the definition of free cash flow we use throughout the book:

$$\text{FCF} = \text{EBIT} - \text{Operating Taxes} - \text{Net Investment}$$

Next, focus on the denominator. To derive the weighted average cost of capital (WACC), start with equation B.1, and multiply CF_e by 1, denoted as $(k_e - g)/(k_e - g)$:

$$V = (D+E)\left(\frac{\text{FCF}}{D(1-T_m)k_d + \dfrac{\text{CF}_e}{k_e - g}(k_e - g) - D(g)}\right)$$

where k_e = cost of equity.

If equity cash flows are growing at a constant rate, the value of equity equals CF_e divided by $(k_e - g)$. Therefore, the growing perpetuity in the denominator can be replaced by the value of equity (E) and distributed:

$$V = (D+E)\left(\frac{\text{FCF}}{D(1-T_m)k_d + E(k_e) - E(g) - D(g)}\right)$$

In the denominator, collapse $E(g)$ and $D(g)$ into a single term:

$$V = (D+E)\left(\frac{\text{FCF}}{D(1-T_m)k_d + E(k_e) - (D+E)g}\right)$$

To complete the derivation of WACC in the denominator, divide the numerator and denominator by $(D + E)$. This will eliminate the $(D + E)$ expression on the left and place it in the denominator as a divisor. Distributing the term across the denominator, the result is the following equation:

$$V = \frac{\text{FCF}}{\dfrac{D}{D+E}(k_d)(1-T_m) + \dfrac{E}{D+E}(k_e) - \dfrac{D+E}{D+E}(g)}$$

The expression in the denominator is the weighted average cost of capital (WACC) minus the growth in cash flow (g). Therefore, equation B.1 can be rewritten as:

$$V = \frac{\text{FCF}}{\text{WACC} - g}$$

such that:

$$\text{WACC} = \frac{D}{D+E}(k_d)(1 - T_m) + \frac{E}{D+E}(k_e)$$

Note how the after-tax cost of debt and the cost of equity are weighted by each security's *market* weight to enterprise value. This is why you should use market-based values, and not book values, to build the cost of capital. This is also why you should discount free cash flow at the weighted average cost of capital to determine enterprise value. Remember, however, that you can use a constant WACC over time only when leverage is expected to remain constant (i.e., debt grows as the business grows).[2]

ADJUSTED PRESENT VALUE

To determine enterprise value using adjusted present value, once again start with $V = D + E$ and multiply by a fraction equal to 1. This time, however, do not include the marginal tax rate in the fraction:

$$V = (D + E)\left(\frac{D(k_d) + \text{CF}_e - D(g)}{D(k_d) + \text{CF}_e - D(g)}\right)$$

Following the same process as before, convert each cash flow in the denominator to its present value times its expected return, and divide the fraction by $(D + E)/(D + E)$:

$$V = \frac{D(k_d) + \text{CF}_e - D(g)}{\frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) - g}$$

Appendix C shows that if the company's interest tax shields have the same risk as the company's operating assets (as one would expect when the company maintains a constant capital structure), the fraction's denominator equals

[2]To see this restriction applied in a more general setting, see Miles and Ezzell, "Weighted Average Cost of Capital."

k_u, the unlevered cost of equity, minus the growth in cash flow (g). Make this substitution into the previous equation:

$$V = \frac{D(k_d) + \text{CF}_e - D(g)}{k_u - g}$$

Next, focus on the numerator. Substitute the definitions of cash flow to debt and cash flow to equity as we did earlier in this appendix:

$$V = \frac{\text{Interest} + \text{EBIT} - \text{Interest} - \text{Taxes} - \text{Net Investment} + D(g) - D(g)}{k_u - g}$$

In this equation, the two interest terms cancel and the two $D(g)$ terms cancel, so simplify by canceling these terms. Also insert T_m(Interest) – T_m(Interest) into the numerator of the expression:

$$V = \frac{\text{EBIT} - \text{Taxes} + T_m(\text{Interest}) - T_m(\text{Interest}) - \text{Net Investment}}{k_u - g}$$

Aggregate reported taxes and the negative expression for T_m(Interest) into all-equity taxes. Move the positive expression for T_m(Interest) into a separate fraction:

$$V = \frac{\text{EBIT} - [\text{Taxes} + T_m(\text{Interest})] - \text{Net Investment}}{k_u - g} + \frac{T_m(\text{Interest})}{k_u - g}$$

At this point, we once again have free cash flow in the numerator of the first fraction. The second fraction equals the present value of the interest tax shield. Thus, enterprise value equals free cash flow discounted by the unlevered cost of equity plus the present value of the interest tax shield:

$$V = \frac{\text{FCF}}{k_u - g} + \text{PV(Interest Tax Shield)}$$

This expression is commonly referred to as adjusted present value.

In this simple proof, we assumed tax shields should be discounted at the unlevered cost of equity. This need not be the case. Some financial analysts discount expected interest tax shields at the cost of debt. If you do this, however, free cash flow discounted at the traditional WACC (defined earlier) and adjusted present value will lead to different valuations. In this case, WACC must be adjusted to reflect the alternative assumption concerning the risk of tax shields.

APPENDIX C

Levering and Unlevering the Cost of Equity

Chapter 8 valued a company using adjusted present value (APV). One key input for APV is the unlevered cost of equity. This appendix derives various formulas that can be used to compute the unlevered cost of equity under different assumptions.

Chapter 13 detailed a second application for the unlevered cost of equity. To determine the cost of equity for use in a company's cost of capital, we do not use raw regression results (because of estimation error). Instead, we rely on an unlevered *industry* beta that is relevered to the company's target capital structure. To build an unlevered industry beta, we use techniques identical to those used for building the unlevered cost of equity. This appendix discusses both.

UNLEVERED COST OF EQUITY

Franco Modigliani and Merton Miller postulated that the market value of a company's economic assets, such as operating assets (V_u) and tax shields (V_{txa}), should equal the market value of its financial claims, such as debt (D) and equity (E):

$$V_u + V_{txa} = \text{Enterprise Value} = D + E \tag{C.1}$$

A second result of Modigliani and Miller's work is that the total risk of the company's economic assets, operating and financial, must equal the total risk of the financial claims against those assets:

$$\frac{V_u}{V_u + V_{txa}}(k_u) + \frac{V_{txa}}{V_u + V_{txa}}(k_{txa}) = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) \tag{C.2}$$

where k_u = unlevered cost of equity
k_{txa} = cost of capital for the company's interest tax shields
k_d = cost of debt
k_e = cost of equity

The four terms in this equation represent the proportional risk of operating assets, tax assets, debt, and equity, respectively.

Since the cost of operating assets (k_u) is unobservable, it is necessary to solve for it using the equation's other inputs. The required return on tax shields (k_{txa}) also is unobservable. With two unknowns and only one equation, it is therefore necessary to impose additional restrictions to solve for k_u. If debt is a constant proportion of enterprise value (i.e., debt grows as the business grows), k_{txa} equals k_u. Imposing this restriction leads to the following equation:

$$\frac{V_u}{V_u + V_{txa}}(k_u) + \frac{V_{txa}}{V_u + V_{txa}}(k_u) = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e)$$

Combining terms on the left side generates an equation for the unlevered cost of equity when debt is a constant proportion of enterprise value:

$$k_u = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) \tag{C.3}$$

Since most companies manage their debt to value to stay within a particular range, we believe this formula and its resulting derivations are the most appropriate for standard valuation.

Unlevered Cost of Equity When k_{txa} Equals k_d

Some financial analysts set the required return on interest tax shields equal to the cost of debt. In this case, equation C.2 can be expressed as follows:

$$\frac{V_u}{V_u + V_{txa}}(k_u) + \frac{V_{txa}}{V_u + V_{txa}}(k_d) = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e)$$

To solve for k_u, multiply both sides by enterprise value:

$$V_u(k_u) + V_{txa}(k_d) = D(k_d) + E(k_e)$$

and move $V_{txa}(k_d)$ to the right side of the equation:

$$V_u(k_u) = (D - V_{txa})k_d + E(k_e)$$

EXHIBIT C.1 **Unlevered Cost of Equity**

	Dollar level of debt fluctuates	Dollar level of debt is constant
Tax shields have same risk as operating assets $k_{txa} = k_u$	$k_u = \frac{D}{D+E} k_d + \frac{E}{D+E} k_e$	$k_u = \frac{D}{D+E} k_d + \frac{E}{D+E} k_e$
Tax shields have same risk as debt $k_{txa} = k_d$	$k_u = \frac{D - V_{txa}}{D - V_{txa} + E} k_d + \frac{E}{D - V_{txa} + E} k_e$	$k_u = \frac{D(1 - T_m)}{D(1 - T_m) + E} k_d + \frac{E}{D(1 - T_m) + E} k_e$

Note: k_e = cost of equity
k_d = cost of debt
k_u = unlevered cost of equity
k_{txa} = cost of capital for tax shields
T_m = marginal tax rate
D = debt
E = equity
V_{txa} = present value of tax shields

To eliminate V_u from the left side of the equation, rearrange equation C.1 to $V_u = D - V_{txa} + E$, and divide both sides by this value:

$$k_u = \frac{D - V_{txa}}{D - V_{txa} + E}(k_d) + \frac{E}{D - V_{txa} + E}(k_e) \tag{C.4}$$

Equation C.4 mirrors equation C.2 closely. It differs from equation C.2 only in that the market value of debt is reduced by the present value of expected tax shields.

Exhibit C.1 summarizes four methods to estimate the unlevered cost of equity. The two formulas in the top row assume that the risk associated with interest tax shields (k_{txa}) equals the risk of operations (k_u). When this is true, whether debt is constant or expected to change, the formula remains the same.

The bottom-row formulas assume that the risk of interest tax shields equals the risk of debt. On the left, future debt can take on any value. On the right, an additional restriction is imposed that debt remains constant (in absolute terms, not as a percentage of enterprise value). In this case, the annual interest payment equals $D(k_d)$, and the annual tax shield equals $D(k_d)(T_m)$. Since tax shields are constant, they can be valued using a constant perpetuity:

$$\text{PV (Tax Shields)} = \frac{D(k_d)(T_m)}{k_d} = D(T_m)$$

Consequently, V_{txa} in the formula in the bottom left corner is replaced with $D(T_m)$. The equation is simplified by converting $D - D(T_m)$ into $D(1 - T_m)$. The resulting equation is presented in the bottom right corner.

LEVERED COST OF EQUITY

In certain situations, you will have already estimated the unlevered cost of equity and need to relever the cost of equity to a new target structure. In this case, use equation C.2 to solve for the levered cost of equity, k_e:

$$\frac{V_u}{V_u + V_{txa}}(k_u) + \frac{V_{txa}}{V_u + V_{txa}}(k_{txa}) = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e)$$

Multiply both sides by enterprise value:

$$V_u(k_u) + V_{txa}(k_{txa}) = D(k_d) + E(k_e)$$

Next, subtract $D(k_d)$ from both sides of the equation:

$$V_u(k_u) - D(k_d) + V_{txa}(k_{txa}) = E(k_e)$$

and divide the entire equation by the market value of equity, E:

$$k_e = \frac{V_u}{E}(k_u) - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_{txa})$$

To eliminate V_u from the right side of the equation, rearrange equation C.1 to $V_u = D - V_{txa} + E$, and use this identity to replace V_u:

$$k_e = \frac{D - V_{txa} + E}{E}(k_u) - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_{txa})$$

Distribute the first fraction into its component parts:

$$k_e = \frac{D}{E}(k_u) - \frac{V_{txa}}{E}(k_u) + k_u - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_{txa}) \qquad \text{(C.5)}$$

Consolidating terms and rearranging leads to the general equation for the cost of equity:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) - \frac{V_{txa}}{E}(k_u - k_{txa}) \qquad \text{(C.6)}$$

If debt is a constant proportion of enterprise value (i.e., debt grows as the business grows), k_u will equal k_{txa}. Consequently, the final term drops out:

$$k_e = k_u + \frac{D}{E}(k_u - k_d)$$

We believe this equation best represents the relationship between the levered cost of equity and the unlevered cost of equity.

The same analysis can be repeated under the assumption that the risk of interest tax shields equals the risk of debt. Rather than repeat the first few steps, we start with equation C.5:

$$k_e = \frac{D}{E}(k_u) - \frac{V_{txa}}{E}(k_u) + k_u - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_{txa})$$

To solve for k_e, replace k_{txa} with k_d:

$$k_e = \frac{D}{E}(k_u) - \frac{V_{txa}}{E}(k_u) + k_u - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_d)$$

Consolidate like terms and reorder:

$$k_e = k_u + \frac{D - V_{txa}}{E}(k_u) - \frac{D - V_{txa}}{E}(k_d)$$

Finally, further simplify the equation by once again combining like terms:

$$k_e = k_u + \frac{D - V_{txa}}{E}(k_u - k_d)$$

The resulting equation is the levered cost of equity for a company whose debt can take any value but whose interest tax shields have the same risk as the company's debt.

Exhibit C.2 summarizes the formulas that can be used to estimate the levered cost of equity. The top row in the exhibit contains formulas that assume k_{txa} equals k_u. The bottom row contains formulas that assume k_{txa} equals k_d. The formulas on the left side are flexible enough to handle any future capital structure but require valuing the tax shields separately. The formulas on the right side assume the dollar level of debt is fixed over time.

EXHIBIT C.2 **Levered Cost of Equity**

	Dollar level of debt fluctuates	Dollar level of debt is constant
Tax shields have same risk as operating assets $k_{txa} = k_u$	$k_e = k_u + \frac{D}{E}(k_u - k_d)$	$k_e = k_u + \frac{D}{E}(k_u - k_d)$
Tax shields have same risk as debt $k_{txa} = k_d$	$k_e = k_u + \frac{D - V_{txa}}{E}(k_u - k_d)$	$k_e = k_u + (1 - T_m)\frac{D}{E}(k_u - k_d)$

Note: k_e = cost of equity
k_d = cost of debt
k_u = unlevered cost of equity
k_{txa} = cost of capital for tax shields
T_m = marginal tax rate
D = debt
E = equity
V_{txa} = present value of tax shields

LEVERED BETA

Similarly to the cost of capital, the weighted average beta of a company's assets, both operating and financial, must equal the weighted average beta of its financial claims:

$$\frac{V_u}{V_u + V_{txa}}(\beta_u) + \frac{V_{txa}}{V_u + V_{txa}}(\beta_{txa}) = \frac{D}{D+E}(\beta_d) + \frac{E}{D+E}(\beta_e)$$

Since the form of this equation is identical to the cost of capital, it is possible to rearrange the formula using the same process as previously described. Rather than repeat the analysis, we provide a summary of levered beta in Exhibit C.3. As expected, the first two columns are identical in form to Exhibit C.2, except that the beta (β) replaces the cost of capital (k).

By using beta, it is possible to make one additional simplification. If debt is risk free, the beta of debt is 0, and β_d drops out. This allows us to convert the following general equation (when β_{txa} equals β_u):

$$\beta_e = \beta_u + \frac{D}{E}(\beta_u - \beta_d)$$

into the following:

$$\beta_e = \left(1 + \frac{D}{E}\right)\beta_u$$

EXHIBIT C.3 **Levered Beta**

	Dollar level of debt fluctuates	Dollar level of debt is constant and debt is risky	Debt is risk free
Tax shields have same risk as operating assets $\beta_{txa} = \beta_u$	$\beta_e = \beta_u + \frac{D}{E}\left(\beta_u - \beta_d\right)$	$\beta_e = \beta_u + \frac{D}{E}\left(\beta_u - \beta_d\right)$	$\beta_e = \left(1 + \frac{D}{E}\right)\beta_u$
Tax shields have same risk as debt $\beta_{txa} = \beta_d$	$\beta_e = \beta_u + \frac{D - V_{txa}}{E}\left(\beta_u - \beta_d\right)$	$\beta_e = \beta_u + \left(1 - T_m\right)\frac{D}{E}\left(\beta_u - \beta_d\right)$	$\beta_e = \left[1 + \left(1 - T_m\right)\frac{D}{E}\right]\beta_u$

Note: β_e = beta of equity
β_d = beta of debt
β_u = unlevered beta of equity
β_{txa} = beta of capital for tax shields
T_m = marginal tax rate
D = debt
E = equity
V_{txa} = present value of tax shields

This last equation is an often-applied formula for levering (and unlevering) beta when the risk of interest tax shields (β_{txa}) equals the risk of operating assets (β_u) *and* the company's debt is risk free. For investment-grade companies, debt is near risk free, so any errors using this formula will be small. If the company is highly leveraged, however, errors can be large. In this situation, estimate the beta of debt, and use the more general version of the formula.

APPENDIX D

Leverage and the Price-to-Earnings Multiple

This appendix demonstrates that the price-to-earnings (P/E) multiple of a levered company depends on its unlevered (all-equity) P/E, its cost of debt, and its debt-to-value ratio. When the unlevered P/E is less than $1/k_d$ (where k_d equals the cost of debt), the P/E falls as leverage rises.* Conversely, when the unlevered P/E is greater than $1/k_d$, the P/E rises with increased leverage.

In this proof, we assume the company faces no taxes and no distress costs. We do this to avoid modeling the complex relationship between capital structure and enterprise value. Instead, our goal is to show that there is a systematic relationship between the debt-to-value ratio and the P/E.

STEP 1: DEFINING UNLEVERED P/E

To determine the relationship between P/E and leverage, start by defining the unlevered P/E (PE_u). When a company is entirely financed with equity, its enterprise value equals its equity value, and its net operating profit less adjusted taxes (NOPLAT) equals its net income:

$$\text{PE}_u = \frac{V_{\text{ENT}}}{\text{NOPLAT}_{t+1}}$$

where V_{ENT} = enterprise value
NOPLAT_{t+1} = net operating profit less adjusted taxes in year $t + 1$

*This relationship only holds when the firm pays no taxes. To determine the relationship with taxes, one must model the relationship between leverage and enterprise value, which in practice is unobservable.

This equation can be rearranged to solve for the enterprise value, which we will use in the next step:

$$V_{\text{ENT}} = \text{NOPLAT}_{t+1}(\text{PE}_u) \tag{D.1}$$

STEP 2: LINKING NET INCOME TO NOPLAT

For a company partially financed with debt, net income (NI) equals NOPLAT less after-tax interest payments. Assuming the value of debt equals its face value and the company's tax rate is zero, the company's after-tax interest expense will equal the cost of debt times the value of debt, which can be defined by multiplying enterprise value by the debt-to-value ratio:

$$\text{NI}_{t+1} = \text{NOPLAT}_{t+1} - V_{\text{ENT}}\left(\frac{D}{V}\right)k_d$$

Substitute equation D.1 for the enterprise value:

$$\text{NI}_{t+1} = \text{NOPLAT}_{t+1} - \text{NOPLAT}_{t+1}(\text{PE}_u)\left(\frac{D}{V}\right)k_d$$

Factor NOPLAT into a single term:

$$\text{NI}_{t+1} = \text{NOPLAT}_{t+1}\left[1 - \text{PE}_u\left(\frac{D}{V}\right)k_d\right] \tag{D.2}$$

STEP 3: DERIVING LEVERED P/E

At this point, we are ready to solve for the company's price-to-earnings ratio. Since P/E is based on equity values, first convert enterprise value to equity value. To do this, once again start with equation D.1:

$$V_{\text{ENT}} = \text{NOPLAT}_{t+1}(\text{PE}_u)$$

To convert enterprise value into equity value, multiply both sides by 1 minus the debt-to-value ratio:

$$V_{\text{ENT}}\left(1 - \frac{D}{V_{\text{ENT}}}\right) = \text{NOPLAT}_{t+1}(\text{PE}_u)\left(1 - \frac{D}{V_{\text{ENT}}}\right)$$

Distribute V_{ENT} into the parentheses:

$$V_{\text{ENT}} - D = \text{NOPLAT}_{t+1}(\text{PE}_u)\left(1 - \frac{D}{V_{\text{ENT}}}\right)$$

Replace enterprise value (V_{ENT}) minus debt (D) with equity value (E):

$$E = \text{NOPLAT}_{t+1}(\text{PE}_u)\left(1 - \frac{D}{V_{\text{ENT}}}\right)$$

Next, use equation D.2 to eliminate NOPLAT_{t+1}:

$$E = \frac{\text{NI}_{t+1}(\text{PE}_u)\left(1 - \frac{D}{V}\right)}{1 - \text{PE}_u\left(\frac{D}{V}\right)k_d}$$

Divide both sides by net income to find the levered P/E:

$$\frac{E}{\text{NI}_{t+1}} = \frac{\text{PE}_u - \text{PE}_u\left(\frac{D}{V}\right)}{1 - \text{PE}_u\left(\frac{D}{V}\right)k_d}$$

At this point, we have a relationship between equity value and net income, which depends on the unlevered P/E, the debt-to-value ratio, and the cost of debt. Debt to value, however, is in both the numerator and the denominator, so it is difficult to distinguish how leverage affects the levered P/E. To eliminate the debt-to-value ratio in the numerator, use a few algebraic tricks. First, multiply both the numerator and denominator by k_d:

$$\frac{E}{\text{NI}_{t+1}} = \frac{\text{PE}_u(k_d) - \text{PE}_u\left(\frac{D}{V}\right)(k_d)}{k_d\left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]}$$

Next, subtract and add 1 (a net difference of 0) in the numerator:

$$\frac{E}{\text{NI}_{t+1}} = \frac{[\text{PE}_u(k_d) - 1] + \left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]}{k_{\text{d}}\left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]}$$

After separating the numerator into two distinct terms, you can eliminate the components of the right-hand term by canceling them with the denominator. This allows you to remove debt to value from the numerator:

$$\frac{E}{\text{NI}_{t+1}} = \frac{\text{PE}_u(k_d) - 1}{k_d\left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]} + \frac{1}{k_d}$$

To simplify the expression further, divide both the numerator and denominator of the complex fraction by k_d:

$$\frac{E}{\mathrm{NI}_{t+1}} = \frac{1}{k_d} + \frac{\mathrm{PE}_u - \frac{1}{k_d}}{1 - \mathrm{PE}_u\left(\frac{D}{V}\right)(k_d)}$$

Finally, multiply the numerator and denominator of the second term by –1:

$$\frac{E}{\mathrm{NI}_{t+1}} = \frac{1}{k_d} + \frac{\frac{1}{k_d} - \mathrm{PE}_u}{\left(\frac{D}{V}\right)k_d(\mathrm{PE}_u) - 1}$$

As this final equation shows, a company's P/E is a function of its unlevered P/E, its cost of debt, and its debt-to-value ratio. When the unlevered P/E equals the reciprocal of the cost of debt, the numerator of the second fraction equals zero, and leverage has no effect on the P/E. For companies with large unlevered P/Es, P/E systematically increases with leverage. Conversely, companies with small unlevered P/Es would exhibit a drop in P/E as leverage rises.

APPENDIX E

Other Capital Structure Issues

This appendix discusses alternative models of capital structure and credit rating estimations. These models offer some interesting insights but tend to be less useful in practice for designing a company's capital structure. Finally, the appendix shows the similarities and differences between widely used credit ratios such as leverage, coverage, and solvency.

PECKING-ORDER THEORY

An alternative to the view that there are trade-offs between equity and debt is a school of thought in finance theory that sees a pecking order in financing.[1] According to this theory, companies meet their investment needs first by using internal funds (from retained earnings), then by issuing debt, and finally by issuing equity. One of the causes of this pecking order is that investors interpret financing decisions by managers as signals of a company's financial prospects. For example, investors will interpret an equity issue as a signal that management believes shares are overvalued. Anticipating this interpretation, rational managers will turn to equity funding only as a last resort, because it could cause the share price to fall. An analogous argument holds for debt issues, although the overvaluation signal is much smaller because the value of debt is much less sensitive to a company's financial success.[2]

According to the theory, companies will have lower leverage when they are more mature and profitable, simply because they can fund internally and do

[1] See G. Donaldson, "Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity" (Harvard Graduate School of Business, Boston, 1961); and S. Myers, "The Capital Structure Puzzle," *Journal of Finance* 39, no. 3 (1974): 575–592.
[2] An exception is, of course, the value of debt in a financially distressed company.

not need any debt or equity funding. However, evidence for the theory is not conclusive. For example, mature companies generating strong cash flows are among the most highly leveraged, whereas the pecking-order theory would predict them to have the lowest leverage. High-tech start-up companies are among the least leveraged, rather than debt-loaded, as the theory would predict.[3] Empirical research shows how the signaling hypotheses underlying the pecking-order theory are more relevant to financial managers in selecting and timing specific funding alternatives than for setting long-term capital structure targets.[4] Surveys among financial executives confirm these findings.[5]

MARKET-BASED RATING APPROACH

Alternative metrics to credit ratings have been developed based on the notion that equity can be modeled as a call option on the company's enterprise value, with the debt obligations as the exercise price.[6] Using option valuation models and market data on price and volatility of the shares, these approaches estimate the future probability of default—that is, the probability that enterprise value will be below the value of debt obligations.[7] The advantage is that all information captured by the equity markets is directly translated into the default estimates. Traditional credit ratings tend to lag changes in a company's performance and outlook because they aim to measure credit quality "through the cycle"[8] and are less sensitive to short-term fluctuations in quality.

The disadvantage of market-based ratings is that no fundamental analysis is performed on the company's underlying business and financial health. If equity markets have missed some critical information, the resulting estimates of default probability do not reflect their omission. As discussed in Chapter 5, markets reflect company fundamentals most of the time, but not always. When they do not, the market-based rating approaches would incorrectly estimate

[3]See M. Barclay and C. Smith, "The Capital Structure Puzzle: Another Look at the Evidence," *Journal of Applied Corporate Finance* 12, no. 1 (1999): 8–20; and M. Baker and J. Wurgler, "Market Timing and Capital Structure," *Journal of Finance* 52, no. 1 (2002): 1–32.

[4]See also A. Hovakimian, T. Opler, and S. Titman, "The Debt-Equity Choice," *Journal of Financial and Quantitative Analysis* 36, no. 1 (2001): 1–24, for evidence that the pecking-order theory predicts short-term movements in corporate debt levels but that long-term changes are more in line with the trade-offs discussed earlier in this section.

[5]J. Graham and H. Campbell, "How Do CFOs Make Capital Budgeting and Capital Structure Decisions?" *Journal of Applied Corporate Finance* 15, no. 1 (2002): 8–23.

[6]This is because equity is a residual claim on the enterprise value after payment of principal and interest for debt. It has value only to the extent that enterprise value exceeds debt commitments. See R. Merton, "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," *Journal of Finance* 29 (1974): 449–470; or for an introduction, R. Brealey and S. Myers, *Principles of Corporate Finance*, 7th ed. (New York: McGraw-Hill, 2003), chap. 24.

[7]See P. Crosbie and J. Bohn, "Modeling Default Risk" (Moody's KMV White Paper, December 2003).

[8]See E. Altman and H. Rijken, "How Rating Agencies Achieve Rating Stability," *Journal of Banking and Finance* 28, no. 11 (2004): 2679–2714.

default risk as well, as happened in the case of Royal KPN Telecom, which took the equity market (and the traditional rating agencies, for that matter) by surprise in 2001, suffering a sudden decline in both share prices and credit ratings.[9]

LEVERAGE, COVERAGE, AND SOLVENCY

The leverage measure used in the academic literature is typically defined as the market value of debt (D) over the market value of debt plus equity (E):

$$\text{Leverage} = \frac{D}{D + E}$$

This ratio measures how much of the company's enterprise value is claimed by debt holders and is an important concept for estimating the benefits of tax shields arising from debt financing. It is therefore also a crucial input in calculating the weighted average cost of capital (WACC; see Chapter 13 on capital structure weights).

Compared with coverage ratios such as earnings before interest, taxes, and amortization (EBITA) to interest, leverage ratios suffer from several drawbacks as a way to measure and target a company's capital structure. First, companies could have very low leverage in terms of market value but still be at a high risk of financial distress if their short-term cash flow is low relative to interest payments. High-growth companies usually have very low levels of leverage, but this does not mean their debt is low-risk. A second drawback is that market value can change radically (especially for high-growth, high-multiple companies), making leverage a fast-moving indicator. For example, several European telecom companies, including Royal KPN Telecom and France Telecom (now called Orange), had what appeared to be reasonable levels of debt financing in terms of leverage during the stock market boom of the late 1990s. Credit providers appeared willing to provide credit even though the underlying near-term cash flows were not very high relative to debt service obligations. But when their market values plummeted in 2001, leverage for these companies shot up, and financial distress loomed. Thus, it is risky to base a capital structure target on a market-value-based measure.

This does not mean that leverage and coverage are fundamentally divergent measures. Far from it: they actually measure the same thing but over different time horizons. For ease of explanation, consider a company that has no

[9] See Crosbie and Bohn, "Modeling Default Risk," 23.

growth in revenues, profit, or cash flows. For this company, it is possible to express the leverage and coverage as follows:[10]

$$\begin{aligned}
\text{Leverage} &= \frac{D}{D+E} \\
&= \frac{\text{Interest}_1 + \text{PV}(\text{Interest}_2) + \ldots + \text{PV}(\text{Interest}_\infty)}{\text{NOPLAT}_1 + \text{PV}(\text{NOPLAT}_2) + \ldots + \text{PV}(\text{NOPLAT}_\infty)} \\
\text{Coverage} &= \frac{\text{EBITA}}{\text{Interest}} = \frac{1}{(1-T)} \times \frac{\text{NOPLAT}}{\text{Interest}}
\end{aligned}$$

where

D = market value of debt

E = market value of equity

NOPLAT_t = net operating profit less adjusted taxes in year t

Interest_t = interest expenses in year t

T = tax rate

The market value of debt captures the present value of all future interest payments, assuming perpetual rollover of debt financing. The enterprise value ($E + D$) is equal to the present value of future NOPLAT, because depreciation equals capital expenditures for a zero-growth company. A leverage ratio therefore measures the company's ability to cover its interest payments over a very long term. The problem is that short-term interest obligations are what mainly get a company into financial distress. Coverage, in contrast, focuses on the short-term part of the leverage definition, keeping in mind that NOPLAT roughly equals EBITA × $(1 - T)$. It indicates how easily a company can service its debt in the near term.

Both measures are meaningful, and they are complementary. For example, if market leverage were very high in combination with strong current interest coverage, this could indicate the possibility of future difficulties in sustaining current debt levels in, for example, a single-product company faced with rapidly eroding margins and cash flows because the product is approaching the end of its life cycle. Despite very high interest coverage today, such a company might not be given a high credit rating, and its capacity to borrow could be limited.

Solvency measures of debt over book value of total assets or equity are seldom as meaningful as coverage or leverage. The key reason is that these book value ratios fail to capture the company's ability to comply with debt service requirements in either the short term or the long term. Market-to-book ratios can vary significantly across sectors and over time, making solvency a poor

[10]The simplifying no-growth assumption is for illustration purposes only. For a growing company, the same point holds.

proxy for long-term ability to service debt. The Dutch publishing company Wolters-Kluwer, for example, had low book equity for years because under Dutch Generally Accepted Accounting Principles (GAAP), it had written off all goodwill on acquisitions directly against equity. In spite of very low solvency, with a ratio of equity to total assets below 20 percent, Wolters-Kluwer had a credit rating around A, well within investment grade.

Solvency becomes more relevant in times of financial distress, when a company's creditors use it as a rough measure of the available collateral. Higher levels of solvency usually indicate that debt holders stand better chances of recovering their principal and interest due—assuming that asset book values are reasonable approximations of asset liquidation values. However, in a going concern, solvency is much less relevant for deciding capital structure than coverage and leverage measures.

APPENDIX F

Technical Issues in Estimating the Market Risk Premium

In its simplest form, the historical market risk premium can be measured by subtracting the return on government bonds from the return (total return to shareholders) on a large sample of companies over some time frame. But this requires many choices that will affect the results. For the best measurement of the risk premium using historical data, follow these guidelines:

Calculate the premium relative to long-term government bonds. When calculating the market risk premium, compare historical market returns with the return on 10-year government bonds. Long-term government bonds match the duration of a company's cash flows better than short-term bonds.

Use the longest period possible. How far back should you look when using historical observations to predict future results? If the market risk premium is stable, a longer history will reduce estimation error. Alternatively, if the premium changes and estimation error is small, a shorter period is better. To determine the appropriate historical period, search for any trends in the market risk premium compared with the imprecision associated with short-term estimates.

To test for the presence of a long-term trend, we regress the U.S. market risk premium against time. Over the past 114 years, no statistically significant trend is observable.[1] Based on regression results, the average excess return has fallen by two basis points a year, but this result cannot be statistically distinguished from zero. Premiums calculated over shorter periods are too volatile

[1]Some authors, such as Jonathan Lewellen, argue that the market risk premium does change over time—and can be measured using financial ratios, such as the dividend yield. We address these models separately. J. Lewellen, "Predicting Returns with Financial Ratios," *Journal of Financial Economics* 74, no. 2 (2004): 209–235.

to be meaningful. For instance, U.S. stocks outperformed bonds by 18 percent in the 1950s but offered no premium in the 1970s. Given the lack of any discernible trend and the significant volatility of shorter periods, use the longest time series possible.

Use an arithmetic average of longer-dated intervals (such as 10 years). When reporting market risk premiums, most data providers report an annual number, such as 6.4 percent per year. But how do they convert a century of data into an annual number? And is the annualized number even relevant?

Annual returns can be calculated using either an arithmetic average or a geometric average. An arithmetic (simple) average sums each year's observed premium and divides by the number of observations:

$$\text{Arithmetic Average} = \frac{1}{T}\sum_{t=1}^{T}\frac{1+R_m(t)}{1+r_f(t)} - 1$$

where T = number of observations
$R_m(t)$ = the market return in year t
$r_f(t)$ = the risk-free rate in year t

A geometric average compounds each year's excess return and takes the root of the resulting product:

$$\text{Geometric Average} = \left(\prod_{t=1}^{T}\frac{1+R_m(t)}{1+r_f(t)}\right)^{\frac{1}{T}} - 1$$

The choice of averaging methodology will affect the results. For instance, between 1900 and 2014, U.S. stocks outperformed long-term government bonds by 6.4 percent per year when averaged arithmetically. Using a geometric average, the number drops to 4.2 percent. This difference is not random; arithmetic averages always exceed geometric averages when returns are volatile.

So which averaging method on historical data best estimates the *expected* rate of return? Well-accepted statistical principles dictate that the best unbiased estimator of the mean (expectation) for any random variable is the arithmetic average. Therefore, to determine a security's expected return for *one period*, the best unbiased predictor is the arithmetic average of many one-period returns. A one-period risk premium, however, can't value a company with many years of cash flow. Instead, long-dated cash flows must be discounted using a compounded rate of return. But when compounded, the arithmetic average will generate a discount factor that is biased upward (too high).

The cause of the bias is quite technical, so we provide only a summary here. There are two reasons why compounding the historical arithmetic average leads to a biased discount factor. First, the arithmetic average may be measured with error. Although this estimation error will not affect a one-period forecast (the error has an expectation of zero), squaring the estimate (as you do in compounding) in effect squares the measurement error, causing the error to be positive. This positive error leads to a multiyear expected return that is too high. Second, a number of researchers have argued that stock market returns are negatively autocorrelated over time. If positive returns are typically followed by negative returns (and vice versa), then squaring the average will lead to a discount factor that overestimates the actual two-period return, again causing an upward bias.

We have two choices to correct for the bias caused by estimation error and negative autocorrelation in returns. First, we can calculate multiyear returns directly from the data, rather than compound single-year averages. Using this method, a cash flow received in 10 years will be discounted by the average 10-year market risk premium, not by the annual market risk premium compounded 10 times.[2] From 1900 through 2014, the average one-year excess return equaled 6.1 percent. The average 10-year cumulative excess return equaled 69.1 percent,[3] which translates to an annual rate of 5.5 percent. Alternatively, researchers have used simulation to show that an estimator proposed by Marshall Blume best adjusts for problems caused by estimation error and autocorrelation of returns:[4]

$$R = \left(\frac{T - N}{T - 1}\right) R_A + \left(\frac{N - 1}{T - 1}\right) R_G$$

where T = number of historical observations in the sample
N = forecast period being discounted
R_A = arithmetic average of the historical sample
R_G = geometric average of the historical sample

[2] Jay Ritter writes, "There is no theoretical reason why one year is the appropriate holding period. People are used to thinking of interest rates as a rate per year, so reporting annualized numbers makes it easy for people to focus on the numbers. But I can think of no reason other than convenience for the use of annual returns." J. Ritter, "The Biggest Mistakes We Teach," *Journal of Financial Research* 25 (2002): 159–168.

[3] To compute the average 10-year cumulative return, we use overlapping 10-year periods. To avoid underweighting early and late observations (for instance, the first observation would be included only once, whereas a middle observation would be included in 10 separate samples), we create a synthetic 10-year period by combining the most recent observations with the oldest observations. Nonoverlapping windows lead to similar results but are highly dependent on the starting year.

[4] D. C. Indro and W. Y. Lee, "Biases in Arithmetic and Geometric Averages as Estimates of Long-Run Expected Returns and Risk Premia," *Financial Management* 26, no. 4 (Winter 1997): 81–90; and M. E. Blume, "Unbiased Estimators of Long-Run Expected Rates of Return," *Journal of the American Statistical Association* 69, no. 347 (September 1974): 634–638.

Blume's estimator depends on the length of time for which you plan to discount. The first year's cash flow should be discounted using the arithmetic average ($T = 130$, $N = 1$), whereas the tenth year's cash flow should discounted based on a return constructed with a 91.7 percent weighting on the arithmetic average and an 8.3 percent weighting on the long-term geometric average ($T = 130$, $N = 10$). The resulting estimator for the 10-year cash flow equals 6.2 percent.

Even with the best statistical techniques, however, these estimates are probably too high, because our sample includes only U.S. data, representing the best-performing market over the last century. Since it is unlikely that the U.S. stock market will replicate its performance over the next century, we adjust downward the historical market risk premium. Research shows that the U.S. arithmetic annual return exceeded a 17-country composite return by 0.8 percent in real terms.[5] If we subtract an 0.8 percent survivorship premium from our range presented earlier, this leads to an expected return between 5.0 percent and 5.5 percent.

[5]E. Dimson, P. Marsh, and M. Staunton, "The Worldwide Equity Premium: A Smaller Puzzle," in *Handbook of Investments: Equity Risk Premium*, ed. R. Mehra (Amsterdam: Elsevier Science, 2007).

Index

D

E

N

P

R

S

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CORPORATE VALUATION MODELING

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A Step-by-Step Guide

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Keith A. Allman

Corporate Valuation Modeling

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Contents

Preface

Another book about financial modeling? You might be rolling your eyes and muttering under your breath, "Why? Aren't there plenty of books that cover this topic?" Yet, you still chose to look inside and see what this one is about. The motivation behind looking at financial modeling books is most likely related to a desire to learn financial modeling in an easy-to-understand, time-efficient, low-cost manner. However, after poring over a few books with the words *Financial Modeling* in the title, you might be left feeling like you know more about specific skills and topics, but not a working financial model. Perhaps these books have given you an understanding of how the model should work, but you are confused as to how to practically implement the information provided. Ultimately, an easy-to-understand, integrated analysis still eludes you.

There's a vast sea of approaches authors take with financial modeling books. Some try to encompass every concept in finance and provide examples of how to implement each concept in Excel. Those are the cookbooks of finance. Introduce a topic, show an Excel example, and then move on to the next topic. Others take a similar approach, but vary the medium. Rather than use Excel, they offer books on financial modeling entirely in code with languages such as VBA or C++. Although many of these books can be highly informative, they often leave it up to the reader to figure out how to connect the individual concepts.

The answer, some say, is books that focus on specific concepts. Rather than covering all possible finance topics, these books hone in on specific areas such as fixed income or derivatives. The problem with many of these books is they often rely too much on delving into the details of the topic and demonstrating formula derivations, instead of dedicating time to showing how to implement the concept. Or, they discuss the implementation and show some screenshots, but fail to provide clear instructions, open functions, and code, much less a complete working model.

To me, the best type of financial modeling book is one that is dedicated to a specific topic within finance, offers multiple examples of implementation, is written in a clear and easy-to-understand manner, and provides a completely integrated example model. There are a few books that have been written in this fashion on topics such as credit risk, interest rates, options, and structured finance, but I find that few have addressed corporate valuation in this manner.

It seems to me that corporate valuation modeling too often gets lumped together in the *general financial modeling* book category. Since a company encompasses many topics in finance it may seem appropriate to cover all of those topics and then assume that the reader can value the company. Unfortunately, connecting the concepts theoretically and implementing those connections on a computer can be just as hard as understanding the individual concept or computer-based implementation in the first place.

Take depreciation as an example. Some books show how to use Excel's prebuilt depreciation functions to create a depreciation schedule. Others discuss depreciation concepts. Yet, few show readers how to create the depreciation schedule in a way that is automated with the associated asset's creation. Further, the prebuilt depreciation functions in Excel need to be turned off so the asset is not overdepreciated depending on the forecast period of the model. Then, once we get the schedule correct, we have to accumulate the depreciation on the balance sheet, remove it from different sections of certain financial statements, and perhaps add it back when dealing with valuation calculations.

This book attempts to address many of these shortfalls by providing a comprehensive, integrated approach to modeling a corporate entity with the primary goal of determining a firm's value. Theory is introduced to guide the reader along the valuation process and connect each concept with the prior and future concepts. Along the way, clear, step-by-step instructions are provided that cover every cell of the included example model. No sections are hidden, password protected, or incomplete.

Beyond concept and implementation issues, after teaching courses on corporate valuation modeling hundreds of times, I have also come to realize that an added layer of complexity is the preexisting skill level of readers. Some are very new to finance and Excel, others new to just finance, others new to just Excel, and some are seasoned in both, but wanting to learn more. While the text itself addresses the finance topics and shows an integrated implementation, the Excel skills can be a challenge for some and a bore for others who already know them. For this reason, there is a Toolbox at the end of each chapter that provides additional information on the Excel functions and techniques that are used in the chapter. This way, the text is not full of background knowledge that would bore the intermediate Excel users, but the content is still there for the beginning Excel user to learn more.

I hope that this book is a valuable resource for people new to finance, seasoned professionals engaged in analysis, and experienced executives trying to learn what their junior staff is doing all night long. I also continually strive to improve my books, find the best possible methods to teach, and ensure that every reader learns. If you are confused by any section or topic related to this book or my other books, if you think you may have found an error, or if you just want to discuss finance-related topics, please feel free to review the Books and Blog section of my company's web site www.enstructcorp.com or personally e-mail me at keith.allman@enstructcorp.com.

Keith A. Allman

Acknowledgments

My father always suggested that I focus on math and quantitative subjects. Early on, I rebelled, thinking he couldn't be further off topic from what I would do in my career. Given that this is my third book on financial modeling, I suppose I should state that he was right. My mother was less adamant about the subject, but to not acknowledge her would undermine the value of her support even to this day. While on the family track, I should note two more family members who have influenced this work. The first is my sister, who was my academic rival when we were children. That energy fomented the fervor with which I have approached all subjects of interest to this day. The second is my grandfather, who lives and breathes the stock market. I am convinced our conversations subconsciously caused my gravitation toward finance. As for more direct acknowledgments, Susan Jane Brett reviewed the book in detail and offered critical comments that led to revisions and clarifications. Her thoroughness is very much appreciated. Also, all of my corporate valuation class participants over the past three years have contributed to this book through the study of their learning methodologies, the development of the curriculum for their courses, and the critical thought caused by their questions. Finally, I would like to thank all of the staff at John Wiley & Sons who work on my books, especially Bill Falloon, Meg Freeborn, and Mary Daniello.

K.A.A.

1

Introduction

Corporate valuation modeling consistently proves challenging because it requires a thorough understanding of two bodies of thought that demand disparate skill sets: finance and technology. On the finance side, we must understand fundamental topics such as *time value of money*, *growth rates*, *debt calculations*, and other subjects that blend accounting, economics, and mathematics. In particular, accounting is a subject that corporate valuation analysts must be well versed in because generally accepted accounting principles (GAAP) or international financial reporting standards (IFRS) need to be followed to make sure analyses are consistent. On the technology side, we must select a program or programming language to utilize and understand the technical functionality of that program well. In many cases, the program is Excel, which requires knowledge of a number of program-specific functions and techniques in order to transfer the financial concepts to an orderly, dynamic analysis. Prior to jumping right to the construction process, we will take a step back and examine the overall process.

OVERVIEW OF THE CORPORATE VALUATION PROCESS

The corporate valuation analysis process itself is quite complex with many moving parts that are intricate to stitch together. Taking a reverse approach, that is, starting with the firm value and tracing back its calculations and components, is a good method of gaining an overview of this process.

Projecting Cash Flow

Figure 1.1 provides a graphical overview of the discounted cash flow valuation process. First, we should establish that we will take a discounted cash flow approach to determining corporate value. Many other methods exist, such as relative valuation and adjusted present value, but the most popular detailed analysis is to *discount expected future cash flows*.

Discounting expected cash flows is a method used in many areas of finance. Bond pricing, securities analysis, and project valuation all use discounted cash flow techniques. Any discounted cash flow technique has two general components: future

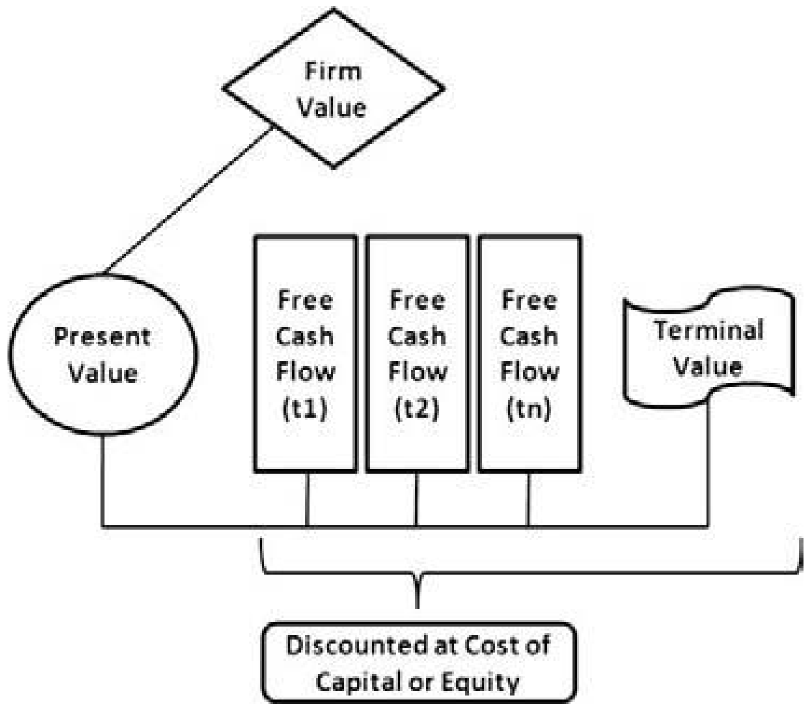


FIGURE 1.1 Overview of the corporate valuation process.

expected cash flows and a rate or rates to discount those cash flows to bring them to the present value. The sum of all present-valued cash flows is the *value*. So the path we first go down is making sure we do the best possible job of estimating future cash flow and calculating discount rates.

Starting with the future cash flows, we have to think about what constitutes cash flow. Is it gross profit, or net income, or earnings before interest and taxes (EBIT)? While those are standard metrics for cash flow, they do not wholly represent cash that can be freely distributed to parties of the firm. We must be able to distinguish between real cash and non-cash items that flow through financial statements and ensure that the company can meet its capital expenditure requirements and fund working capital needs.

Each of the items that lead us to our cash flow can be broken apart into detail. Specific capital expenditures or debt financing plans can be modeled. For instance, we may anticipate debt financing and be the lead bank in a syndicated funding or be part of a bilateral arrangement. In such cases we may be concerned with the priority of cash flows. This level of detail can lead us to more accurate projections of cash flow.

The next challenge with cash flow is the duration of cash flow projection. In discounted cash flow modeling, we typically distinguish between a *forecast period* valuation and a *terminal* valuation. This means that we forecast specific cash flows only for a certain amount of time depending on the purpose of our valuation. Continuing with the debt example, if we plan to issue five-year debt, we may project

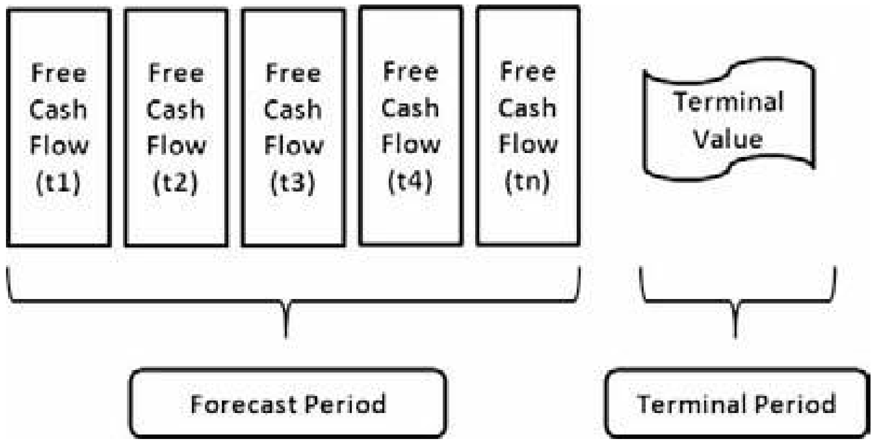


FIGURE 1.2 The forecast period is typically in alignment with a unique period of time for the company. This can be due to a startup period, distress, buyout, new funding, or new projects. The terminal value is the assessment of value after the forecast period.

out five years of a company's cash flow. If we ignore time beyond the five periods, then we make the assumption that the firm is worth nothing after that time period; it essentially vanishes. This is unlikely, because at bare minimum a firm has assets that can be disposed of and the proceeds returned to debt and equity holders. It is even more likely that the firm would continue operations.

Whether we assume the firm is liquidated after the forecast period or that it continues into perpetuity, we need to do more work to make a terminal value assumption. This could require altering assumptions to a long-term perspective and in general applying a different methodology than just cash flow forecasting. Figure 1.2 depicts forecast and terminal value periods.

Discounting Cash Flow

Once we are confident in our cash flow and terminal value, we must determine the proper discount rates to apply to the values in order to get the present-day valuation. If we are looking at the firm from a comprehensive viewpoint, we need to examine what both an equity holder and a debt holder would demand for the firm's risk, respectively known as the *cost of equity* and the *cost of debt*. Picking apart those calculations leads us to further detail.

The cost of equity can be determined using the *capital asset pricing model* (CAPM), which quantifies the rate of return for an equity investor based on a risk-free return, a market-based return, and a quantification of nondiversifiable risk. These factors materialize in the form of the *risk-free rate*, the *market risk premium*, and *beta*. Multiplying beta by the market risk premium and then adding the risk-free rate gets us to the cost of equity for one period. Although this is a good start, we may have different assumptions throughout time for each of these items.

The cost of debt also contributes to our eventual discount rate for the cash flows. The credit quality of the firm and current market conditions determine the spread over the risk-free rate that the company must pay for its debt. Because interest is tax deductible in most cases, the firm's *after-tax* cost of debt is more relevant, meaning we need to also estimate the tax rate to get an accurate assumption.

Overall, both rates may change over the forecast period and can have completely different assumptions for the terminal value period. Further complicating matters is that we do not take a simple average of the two values, but weight each rate by the amounts of debt and equity. Whereas in theory these should be market values, book values are sometimes used as proxies in projections. In cases of expected capital structure changes, the weights can change over time and significantly affect the discount rates, which ultimately affect the valuation.

CONCEPTUAL ROADMAP

Our heads may be spinning in a whirlwind of financial concepts right now. The immediate way to bring order to this chaos is to open our medium of operation, Excel, and start entering information. But without a carefully laid-out plan, this can be disastrous. To prevent such disaster, we will lay out a conceptual roadmap that will guide the corporate valuation process and its materialization in Excel. This conceptual roadmap is shown in Figure 1.3.

The first destination on this map is dates and timing, which provide the framework for our analysis. Once we know what timeframes we are working with, we need to fill in the required information for each period. Because dates and timing is the first concept, it does bring along with it some administrative qualities, such as setting up our assumptions in an intelligible manner and creating an auxiliary sheet to handle administrative items.

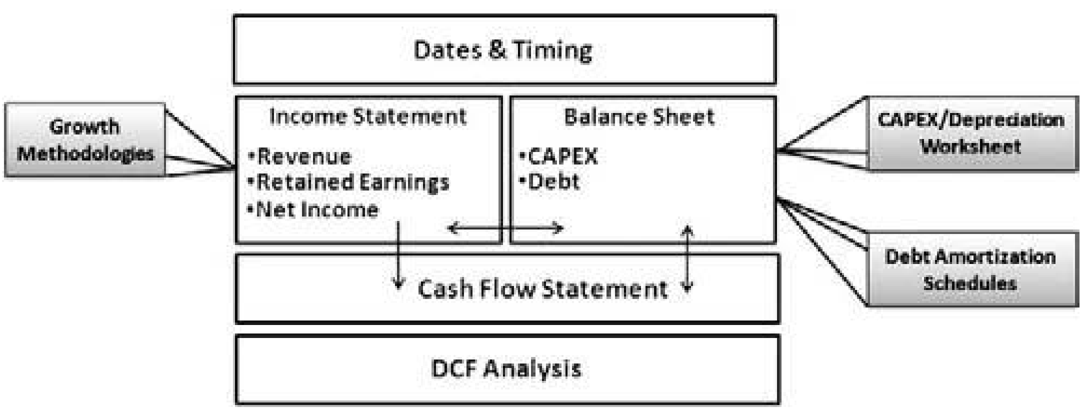


FIGURE 1.3 Building a corporate valuation model should be done using a conceptual approach.

We can then move to the next few locations on our map, which are the financial statements. It's usually easiest to begin with the *income statement*. On that statement our biggest concern is most likely revenue growth, because many assumptions are predicated on this projection. We should therefore focus on understanding growth projection methodologies. Inextricably linked to the income statement is the *balance sheet*. Capital expenditures, depreciation, and debt are key items to the balance sheet, which require further analysis. Once both statements are established, we need to understand their linkages and create functionality that allows the sheets to work harmoniously in projections.

After building in the key calculations of cash flow, we need to make sure that we did so in a precise manner and in a way that is representative of the firm's value. The cash flow statement is established to reconcile cash and validate the model's calculations. Other tests are also built in to focus on important parts of corporate cash flow. Eventually we need to summarize this cash flow in a way that represents the value of the firm, otherwise known as *free cash flow*. The free cash flow is calculated for each period of the forecast period, a terminal value determined, and all values discounted back to the present value at appropriate discount rates.

While our core valuation ends there, we might want to analyze the system we have set up in more detail and build in efficiencies for working with our analysis. An output summary can reorganize information in formats that people are used to, charts can be created to graphically represent data, and automation can be built to allow sensitivity analyses en masse.

TECHNICAL ROADMAP

While the concepts behind corporate valuation may start to make sense, actually transforming these concepts into a model adds the final layer of challenge. Depending on one's background, utilizing Excel for the transformation of corporate valuation concepts to a corporate valuation model is much more challenging than understanding the concepts themselves. Quite frequently people suffer from what I have termed *sheet 1 syndrome*. This condition occurs when someone is intimidated by the vastness of the financial modeling process and stares at the first sheet of a new, blank Excel workbook, wasting time and fretting about what to do first. We will quickly develop a technical roadmap to prevent such an unpleasant condition. Overall, our technical progress should take the following steps in order:

1. Brainstorm and sketch
2. Data collection
3. Assumption verification and aggregation
4. Structural construction
5. Internal validation
6. Output reporting
7. Interpretation

Brainstorm and Sketch

While this seems as if we are going back to elementary school, it is worth taking 30 minutes to an hour to think about the problem that requires modeling. You should employ techniques that are optimized for how you work through problems. For example, I am a very visual problem solver and like to draw out each sheet as a box, connect lines to boxes that represent links in the future Excel model, and write out notes that indicate special functionality that might be required. I once started a model while at a job late at night without taking this step. On the second day of working through the model, I realized I had forgotten a core component and then spent an entire half-day linking up the inserted component. I wasted hours verifying that the links were correct, and probably would not have had to do so if I had inserted the concept in a logical order.

Data Collection

In this book, all of the necessary data is provided, which is unrealistic in our day-to-day jobs. Most financial analysts spend a significant amount of time searching for the best data to use for their analyses. This is done by searching through financial statements, industry reports, consultant studies, and market databases, and engaging in ongoing client communication.

Assumption Verification and Aggregation

Once our data has been collected it is rarely in a format that is ready for use. Financial data may be in values that we do not want to use for our analysis. For instance, we most likely would want a revenue growth rate assumption for our company. We could look historically at revenue amounts and then try different methods of calculating the growth rate. Once we settle on a growth rate methodology, we might want to verify that this is in line with management's plans or that there are non-historical factors that might affect the assumption. We should be rigorous in our approach and do this for as many assumptions, in as much detail, as possible.

Structural Construction

Constructing the framework for calculation is the focus of much of this book. We will definitely cover topics such as assumption verification and aggregation, outputs, and so on, but the core problem people have is binding all of this together in a cohesive model. I believe that the structure of the model is the easy part of the analysis process, once it is understood. After you gain fluidity in the model construction process, the actual framework for the model should occupy about 20% of your time. Determining what goes into the model and understanding the correct analyses to make should occupy the remaining 80%.

Internal Validation

Unfortunately, many people are so anxious to get a result that the moment they come up with a figure they stop. There are many more steps to a proper modeling analysis. As a model is being built it should be constantly tested for validity. Concepts such as assets equaling liabilities plus shareholder's equity or cash from the cash flow statement equaling the cash from the balance sheet should be tested.

Output Reporting

In my first position in a quantitative analytics group there came a time when I finally was responsible for my own analysis. When I turned the analysis in, I handed over nearly a hundred pages of cash flow scenarios with a summary sheet on top. My manager took the packet of information, ripped off the summary sheet, and threw the rest in the trash bin. The point of explaining this is that you should understand what data your audience wants. In that case, I was presenting results to a manager who wanted only a top-level understanding of the data. If I had presented the data to a risk manager or another quantitative analyst, they might have wanted the cash flow scenarios. The best models and modelers can get overlooked due purely to output presentation (sad, but true in the field of finance).

Interpretation

Finally, you must understand the model that you have built. Especially if you must present the analysis to others, you must be well versed in the resulting changes in the model given changes in the assumptions. This means that you should test the model with reasonable extremes. Take growth down to 0% in one scenario. What happens to the firm's value? Then take growth up to 100% each period. Does the firm's value increase? Try out many combinations of assumptions, such as increasing capital expenditures and adding a debt layer to pay for it. Can the company afford the expected debt payments each period? Similar to output reporting, people lose faith in a model that returns unexplainable results.

A FEW BEST PRACTICES REGARDING FINANCIAL MODELING

Over the years of financial modeling development, I have discovered a number of best practices. Conforming to the following allows other users easier interpretation and prevents errors:

1. *Use consistent formulas for rows or columns*. Whether it is to be dragged across columns or up and down rows, the formula should be the same. Differences usually occur during certain time periods, which suggests the need for functions that give our formulas optionality.

2. *Never combine a hard-coded assumption with a formula*. If you find yourself inserting numbers into a formula, you should consider making that number a formal assumption in the appropriate section.
3. *Hard-coded values should be formatted using blue bold font*. Formulas are typically kept in black-colored font. The origins of these formatting conventions are unclear, but they are market practice and allow users to quickly identify assumptions and formulas.
4. *Corporate models frequently organize time going across columns, whereas asset-based and project finance models occasionally organize time going up and down rows*. This convention is due to the 256-column constraint of Excel 2003 and earlier. Although Excel 2007 has plenty of columns, I have found that many financial modelers still adhere to these conventions.

HOW THIS BOOK WORKS

This book is designed in a manner similar to the corporate valuation courses I teach in person. Both rely on theory and practical exercises to transform the concepts into a dynamic, usable model. Just as my courses work through individual *modules* of corporate valuation that culminate in a complete firm valuation, this book has readers work through similar modules, chapter after chapter. Each section begins with a discussion of theory and then moves on to a Model Builder exercise where the theory is transferred to an application in Excel. Eventually, as all theory concepts are read and Model Builder exercises completed, the reader should have an operational model that is identical to the one included on the CD-ROM that is packaged with this book.

While theory and implementation are two critical elements, one of the biggest challenges of teaching financial modeling is the different skill levels of readers. In my classes, I am able to teach to various levels of difficulty and explain functionality as needed. In print, this is clearly not possible, but I have tried to address the issue of varying skill levels by creating sections at the end of each chapter called *toolboxes*. These sections explain Excel functions and techniques that are used throughout the chapter. Readers who are beginners will find it valuable to go through every Toolbox. Intermediate readers can selectively choose which Toolbox sections to read, and advanced readers can skip them altogether. Figure 1.4 depicts the book's approach.

Excel 2003 and Earlier versus Excel 2007

At the current time, many users have switched to Excel 2007; but many, if not more, are still using Excel 2003. While the powerful differences between the two versions of Excel are related to memory accessibility and usage, there are major shifts in the menus. When technical books provide instruction for only one version, and the user has a different version, the alterations to the menus can cause confusion. For

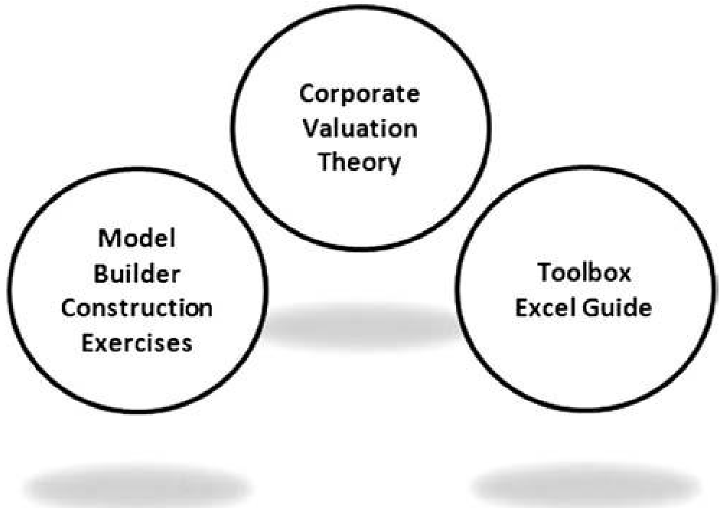


FIGURE 1.4 Each chapter will follow a similar pattern, starting with corporate valuation theory, then model implementation, followed by a Toolbox to assist with Excel functions and techniques.

this reason, I will provide instruction for both versions of Excel wherever there are instructions that could be significantly different between the two versions.

Differences between Excel versions will not be an issue when this book discusses Visual Basic Applications (VBA) in Chapter 11, since the Visual Basic Editor (VBE) and the VBA code have largely gone unchanged. The only caveat is that users who are using Excel 1997 or earlier may encounter problems since there were many updates to VBA after that version.

A Few Words about Semantics

Learning about financial modeling can be tricky in written form since words translate into *commands*, which can be very specific for computer programs. In this text we are using Excel as the modeling program, which is primarily operated by *menus*, *worksheets*, and *cells* within the worksheets. For the menus in Excel 2003, I will often use the word *select*, which would be synonymous with left-clicking the stated menu. There could be multiple options, where once you left-click you might have to move the cursor down and over to find the correct sub-selection. For instance, if you wanted to open the Add-Ins dialogue box you would have to select **Tools**, then move the cursor down to **Add-Ins** and select or left-click again. The process is slightly different for Excel 2007, where there is a *ribbon system*. In the ribbon system you still must select or left-click on a tab, but instead of having a drop-down of sub-selections there are graphical icons that must be selected. These graphical icons are grouped into subsets, such as the Font subset, within the Home tab.

The process of using workbooks and cells is relatively similar between Excel 2003 and Excel 2007. The key is that there are four main operations we will perform on a cell:

1. Enter a *value*. When the Model Builder exercises ask for a value to be entered, this will be a number, date, or Boolean (TRUE or FALSE) value. These are values that will be referenced for some type of calculation purpose.
2. Enter a *label*. A label is text in a cell to help the model operator understand values and formulas in relative proximity. Note that I use the word as a verb as well. For example, I may say "label cell A1, **Project Basic Cash Flow**." This means that the text "Project Basic Cash Flow" should be entered into cell A1.
3. *Name* a cell or range of cells. Not to be confused with labeling, naming is a specific technique that converts the reference of a cell or range to a user-defined name. This process is detailed in the Toolbox section of this chapter.
4. Enter a *formula*. The core reason we are using Excel is for calculation purposes. A formula is initiated in Excel with the "=" sign. When I say to enter a formula, I will provide the cell it should be entered in and the exact formula that should be entered. Often I have copied this formula from the Excel model itself to ensure that the text corresponds to the example model provided on the CD-ROM.

MODEL BUILDER 1.1: INITIAL SETTINGS AND ASSUMPTIONS SHEET SETUP

In our first Model Builder, we should take a moment to understand how this section differs from other parts of the book. Each Model Builder is an instructional section that should be completed with the use of a computer running Excel. It should be followed step-by-step using the instructions. Each Model Builder assumes that the previous Model Builder was read and implemented. The eventual result of the Model Builder sections is the Corporate_Basic.xls model provided on the CD-ROM. If at any point you find yourself lost, you should open the Corporate_Basic.xls file to see how the relevant section should be completed.

This first Model Builder is to make sure that our versions of Excel are all set to identical settings and to start constructing the model on the Assumptions sheet. Depending on how you installed Microsoft Excel or Office, you might need the installation disc to enable all of these settings.

1. We will be using a few functions and tools that require the Analysis Tool Pak, Analysis Tool Pak VBA, and Solver Add-Ins to be installed. To do this:
   - *For Excel 2007:* Select the **Office** button, select **Excel Options**, select **Add-Ins**, and then select the **Go** button, which is to the right of Manage, and a box that should default to Excel Add-Ins. This will bring up the same box as in

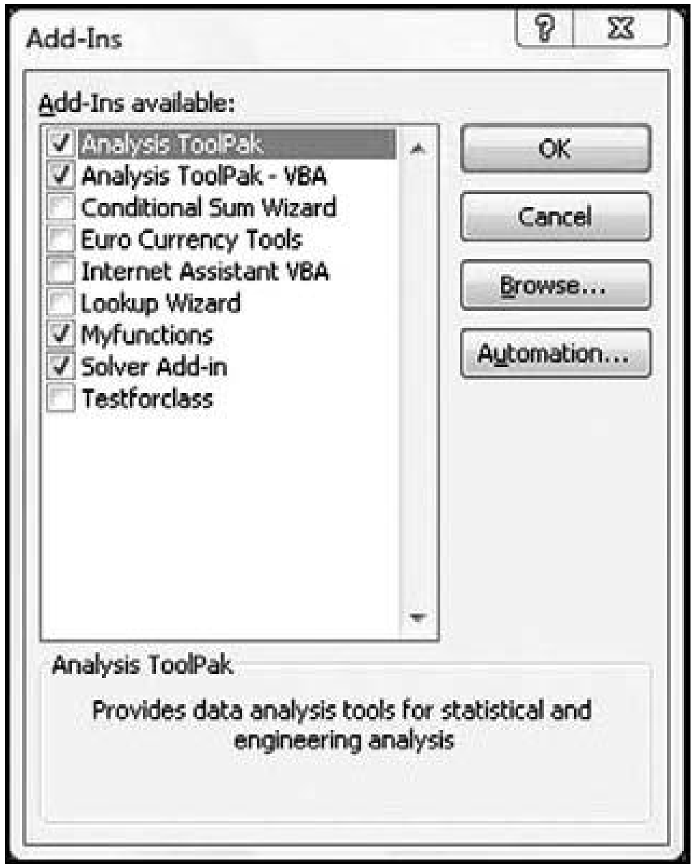


FIGURE 1.5 The Add-In selection box allows users to install pre-created or user-created add-ins.

Figure 1.5. Check the boxes for Analysis Tool Pak, Analysis Tool Pak VBA, and Solver. Select **OK**. If the Add-Ins are not installed, it may prompt you with a few messages stating that Excel will need to install them. Depending on how Excel was initially installed, you might need the installation disc to complete the install.

- *For Excel 2003 and earlier:* Select **Tools**, select **Add-Ins**, and check the boxes for Analysis Tool Pak, Analysis Tool Pak VBA, and Solver. Typically the Analysis Tool Pak and the Analysis Tool Pak VBA are the first two Add-Ins on the Add-Ins list. Solver is usually at the bottom. Select **OK**. If the Add-Ins are not installed, it may prompt you with a few messages stating that Excel will need to install them. Depending on how Excel was initially installed, you might need the installation disc to complete the install. Figure 1.5 depicts the Add-In selection box.

2. The next setting we should set is the ability to run macros. While the core model does not require the use of any macros, Chapter 11 will add significant

automation and functionality through the use of VBA. If you would like to take advantage of this, you will need to complete the following steps.

- *For Excel 2007:* Excel 2007 requires a bit more setup to work with macros. Select the **Office** button, and select **Excel Options**. On the default tab, the Popular tab, check the third checkbox down, entitled "Show the Developer tab in the Ribbon." Press **OK**. Once the Developer tab is visible, select it and then select **Macro Security**. In Excel 2007, you have four options for Macro settings, three of which are similar to Excel 2003. The only exception is that you can disable all macros except ones with a digital signature. Since hardly anyone has taken Microsoft up on their security measures and people rarely use digital signatures for Excel files, we will ignore that option. We can safely set it to disable all macros with notification. The notification will occur when the workbook is opened and will be a button with Options . . . in it at the top of the sheet. Select this button. A new dialogue box will open. Within that dialogue box, under Macros and Active-X, select **Enable This Content** and press **OK**. This dialogue box is shown in Figure 1.6. In Excel 2007, you should not have to restart Excel for this to take effect.
- For Excel 2003 or earlier: Select **Tools**, select **Macros**, select **Security**. You have the choice of either Low, Medium, or High. Low will allow macros

FIGURE 1.6 Once the macro security setting is set to Disable All Macros with Notification, the following Options . . . button appears when workbooks with macros are opened.

without prompting, medium will prompt you to enable or disable macros within a workbook when it is opened, and high disables macros in a workbook. The main concern is that viruses can be built into macros, which can cause significant damage or security concerns. The Corporate_Basic.xls model contains no viruses and can be safely opened with macros enabled. You might want to set your computer to medium security so that you enable only trusted workbooks. For the changes to take effect you must shut down Excel and reopen it. When prompted to enable macros for the Corporate_Basic.xls file, select **Enable**.

3. Once the Add-Ins are installed and the macro security is set, we can actually start constructing our model. The next step is to notice the default setting of the worksheets. There should be three blank sheets named Sheet1, Sheet2, and Sheet3. Change the name of Sheet1 to **Assumptions**.
4. Next we will create a label for the entire project. On the Assumptions sheet in cell A1, enter the text **Project Basic Cash Flow**. Format this text bold blue. The reasoning behind the formatting is grounded in a financial modeling convention, where all variables that are inputs entered as values (otherwise known as *hard coded*) are formatted bold blue. Values returned from formulas are typically left in standard black-font format.
5. Name cell A1 **inputs_ProjName**. Naming cells is distinctly different from entering text as the previous step instructed. For basics on naming cells, refer to the Toolbox section of this chapter for a thorough primer on naming cells and ranges. Cell A1 should look like Figure 1.7.
6. The final step of this brief Model Builder is to save the file—a simple yet commonly forgotten step. As a suggestion, you might want to just add your initials to the end of **Corporate_Basic.xls** (Corporate_Basic_KA.xls, in my case). Most Excel 2003 or earlier users are familiar with the steps to saving, but Excel 2007 users should be careful as there are many new options. In Excel 2007, under Save As, if you select **Excel Workbook** it will save it as the default file for Excel. This is usually set to a macro-free .xlsx file. This means that if you created any code in the file, it will automatically be stripped out and lost. If you want to save a workbook with code (which will be the case if you implement the VBA for the Corporate_Basic model), then you should save it as an Excel Macro-Enabled

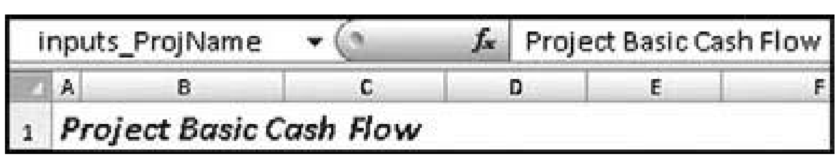


FIGURE 1.7 In cell A1, on the Assumptions sheet, we create a label for the cell by entering text. Notice the cell is also named, as seen by the name inputs_ProjName in the Name Box.

Workbook. Both of these formats are .xlsx and are not compatible with earlier versions of Excel unless the user downloads a special file from Microsoft. If you or another user anticipate using this file with lower versions of Excel, you should save the file as an Excel 97–2003 Workbook. This format is .xls and will not automatically remove macros. The possible file formats for Excel 2007 are shown in Figure 1.8.

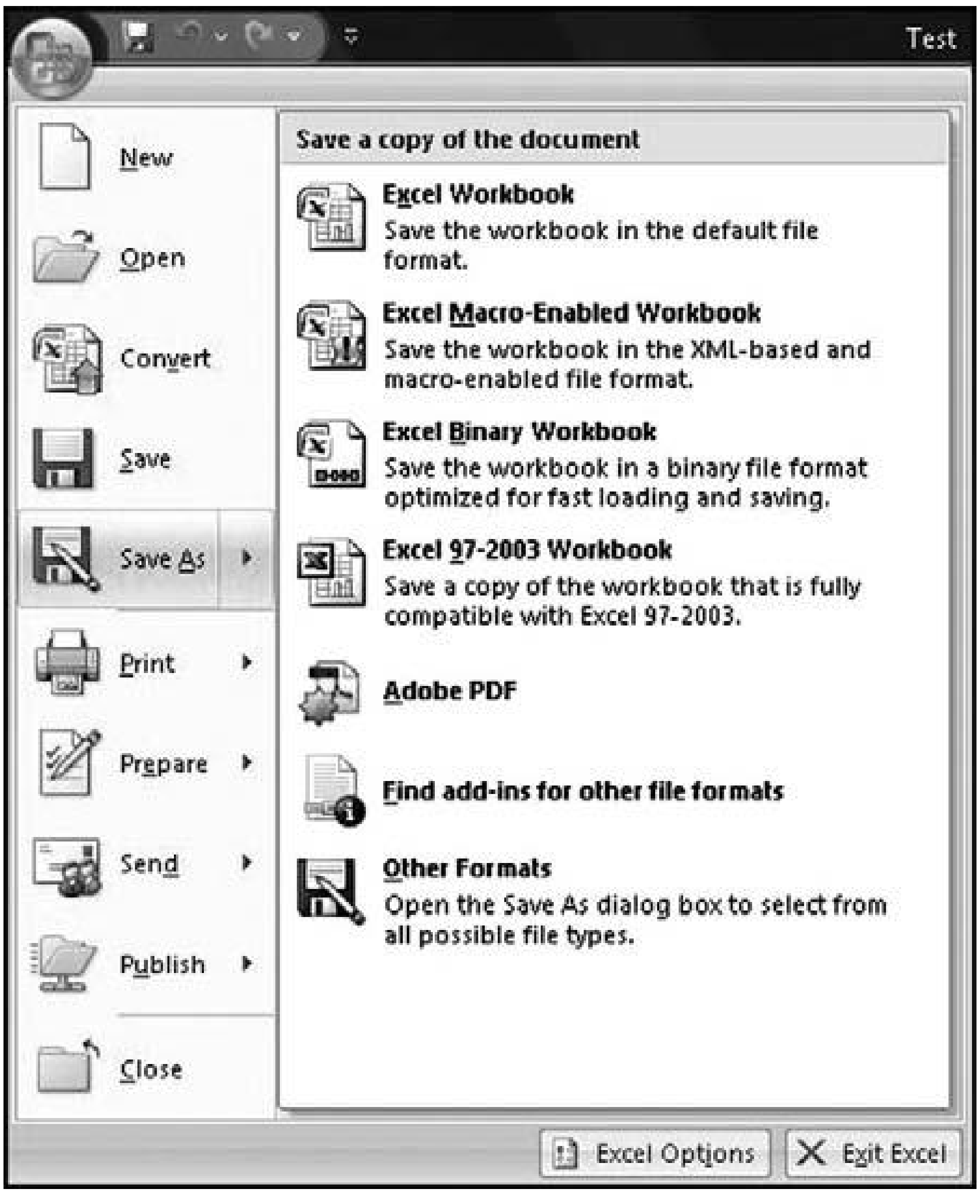


FIGURE 1.8 Be careful when saving files in Excel 2007 as there are many more options.

TOOLBOX: NAMING CELLS

A very common technique used throughout financial modeling is to name a cell or range of cells. To name a cell or a range of cells is to provide an alternative name other than the standard row/column name, such as *cell A1*. Naming cells has a number of advantages:

1. *Named cells are easier to work with in formulas since we can name them with meaning*. For instance, rather than using the range B3 to refer to the current fiscal year date of a model, we could name cell B3 **FY_Current**. When working with formulas, the name would be used rather than *B3*, and the formula would be easier to understand.
2. *Named cells automatically take on absolute references in formulas*. When cells are referenced in formulas, their default setting is set to relative references. This means that if we referenced cell B3 in a formula and dragged the formula cell across one column, the new formula would reference cell C3. This can be prevented by locking down the cell, as described in Chapter 5's Toolbox, or by using a name. A named range is automatically locked down. We can still use the row/column reference, but would have to enter this in by hand since named cells will automatically display the name when referenced.
3. *Named cells allow us to reference values for data validation lists on sheets other than the sheet where the list is being created*. If this is not clear, you should read about data validation lists in Chapter 2's Toolbox section.
4. *Named cells allow the user to find inputs and references faster*. When we push cell F5, we are provided with the Go To dialogue box. This allows us to jump to sections in a model very quickly. When we use named ranges, we can move between them very quickly.
5. *Named cells make in-and-out processes easier when we start using Visual Basic Applications (VBA)*. We will come back to this in Chapter 11 when we implement basic VBA code.

Cells can be named very quickly using the *Name Box* in both Excel 2003 and 2007. The Name Box is located near the upper-left corner of any Excel sheet. Figure 1.9 shows the location of this box.

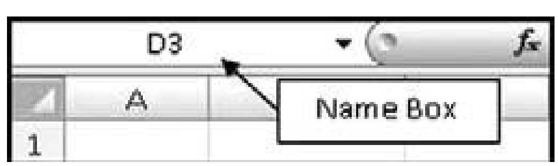


FIGURE 1.9 The Name Box is an area that allows a user to quickly create a name for a cell or range of cells.

There are a couple of rules regarding naming:

1. *Names cannot have spaces*. If you want to use a name with spaces, use underscores. For instance, if you wanted a cell that was named Reserve Account, you would have to name it **Reserve_Account**.
2. *In Excel 2003 and earlier, names cannot begin with a number*. Excel 2007 will allow this; however, when the spreadsheet is saved in Excel 2003 or earlier, a prompt will be generated that informs a user that the names will have the number values removed. This can cause problems if the numbers were the only differentiation between names in the workbook.

Finally, the most common source of error in naming is when the names need to be changed or deleted. Many users try to change names by selecting the cell or cells that are named and typing over the name in the Name Box. While this will generate a new name, it will not get rid of the existing name. The same is true when a user selects a named range, highlights the name in the Name Box, and presses **delete**. In Excel 2003, names should be deleted or references edited under the Insert menu, Names submenu, Define option. This selection brings up the Name dialogue box, which allows a user to delete or edit the name reference. In Excel 2007, users can go to the Formulas tab and select the **Name Manager** button. This selection brings up a similar dialogue box as Excel 2003's Name dialogue box; however, there is additional functionality. In particular, users can edit the name of a range directly through this dialogue box.

2 Dates and Timing

Consider a world without time and how that would impact a financial analysis. It would greatly limit the methodologies we could use to value a company and simultaneously limit the value that could be derived for the firm. At the most extreme level, all we would have would be the current financial statements. Determining the best investment would be a relative analysis involving the highest multiple of earnings with consideration to a strong corporate structure at that given moment. Issues of revenue potential, future cost factors, operating expenditure plans, and financing strategies would not exist. In fact, most of us would be out of jobs since we get paid to project and manage the uncertainties caused by time.

A slightly more advanced level of analysis would give credit to the fact that items on the balance sheet can grow in value either by their operating potential or just by inflation. This still ignores many components of a fully operational firm. The more complex analysis that comes out of completely integrating all factors of time is a discounted cash flow methodology where we make projections of many facets of the firm's structure and operations.

Within the complex framework of a discounted cash flow analysis, multiple time-related issues arise. Andy Warhol once said, "They say time changes things, but you actually have to change them yourself." I rarely quote celebrities, but this epitomizes the issues we deal with in regard to time and discounted cash flow modeling. On one hand, we have to manage concepts that will naturally change over time, such as straight-line depreciation of an asset; on the other hand, we have the ability to change assumptions that affect how the concept changes over time. In the case of depreciation, we can change the useful life of assets that determine the depreciation amounts. These changing time-based variables are true for many of the topics in corporate valuation modeling.

THE NEED FOR A FLEXIBLE SYSTEM

Not only do dates and timing affect multiple parts of an analysis, but they also change frequently. Every day that passes can have a new effect on the analysis. For instance, our model could use the current stock price and shares outstanding to calculate the market value of equity. The stock price changes continuously throughout trading,

Monthly									
	9/1/2009	10/1/2009	11/1/2009	12/1/2009	1/1/2010	2/1/2010	3/1/2010	4/1/2010	5/1/2010
Revenue	529	532	535	538	542	545	548	551	555
Quarterly									
	9/1/2009	12/1/2009	3/1/2010	6/1/2010	9/1/2010	12/1/2010	3/1/2011	6/1/2011	9/1/2011
Revenue	1596	1625	1654	1684	1704	1725	1745	1766	1788
Semi-Annual									
	9/1/2009	3/1/2010	9/1/2010	3/1/2011	9/1/2011	3/1/2012	9/1/2012	3/1/2013	9/1/2013
Revenue	3220	3338	3429	3512	3596	3683	3772	3862	3955
Annual									
	9/1/2009	9/1/2010	9/1/2011	9/1/2012	9/1/2013	9/1/2014	9/1/2015	9/1/2016	9/1/2017
Revenue	6558	6941	7280	7634	8005	8394	8796	9219	9661

FIGURE 2.1 Revenue is shown on a monthly, quarterly, semi-annual, and annual basis. Typically, models will have only one timing set for a scenario. This can be made flexible for fast customization.

while the shares outstanding can also change depending on corporate actions on any given day. As we push the analysis date further into the future, values of the many components of the company change: the rates from which variable-rate interest is indexed, debt amortization, asset depreciation, intangible amortization, capital expenditure plans, and so on. Therefore our modeling will require flexibility as to how we enter dates and set up timing.

Further complicating matters is the division of time into aggregated units. While we could attempt to model out a company on a daily basis or even more granularly on a real-time basis, the amount of data would be overwhelming. In order to rationalize the amount of data and to make the data discrete, we often group data into monthly, quarterly, semi-annual, or annual amounts. Setting such periodicity allows us to see trends and align important events that affect the company. For example, if most of the debt of a company is paying on a quarterly basis, it may be worth projecting the company's cash flows on a quarterly basis to see how well the company can cover the periodic debt service. Figure 2.1 shows some of the common possibilities for organizing timing in a corporate model.

THE FORECAST PERIOD

Another issue that we will run into is the limit of our ability to forecast certain items. Corporate valuation using a discounted cash flow methodology is particularly challenging because we are trying to project cash flows that can have multiple uncertain factors. We are trying to capture many capricious elements such as management's ability to adjust to changing economic and competitive conditions, market changes for unit volumes and prices, and variable capital structures and costs of financing.

This is markedly different from other financial analyses, such as project finance or asset-based financings where contracts exist, which define assumptions that allow an analyst to have a clearer path to determining periodic cash flows.

Due to the increasing uncertainty of forecasted variables over time, we limit our detailed analysis to a forecast period. This forecast period is characterized by periods of frequently changing variables. For instance, if we were to take a look at an Internet company during the late 1990s, we would have expected a very high growth rate, with an eventual reduction of growth to a stable level. This period of high growth would be the forecast period. Converse to a high-growth scenario can be one of distress. An example of this is U.S. automakers, such as General Motors and Chrysler. At the end of 2008, they requested government support to stay solvent and were asked by Congress to provide projected financial statements. In their case, they would have had a forecast period that included a contraction of growth, lower price points, and perhaps increased costs until they could return to a stabilized level. The forecast period would focus on using assumptions that caused contracted growth, prices would be lower in each of the periods, and costs would be ramped up.

Forecast periods also can be determined by planned events. For instance, if a company knew it would have an aggressive capital expenditure plan, then the forecast period would be focused on the periods of capital expenditure. But this forecast period for the same company can vary by perspective. For example, the bank financing the capital expenditure would focus on the term of the debt used for the financing as the forecast period. The forecast period is a limited amount of time that analyzes unusual, short-term situations for a firm.

THE TERMINAL PERIOD

If we used only a forecast period in a valuation, we would be attributing value to the company for only those years. While this could be true for some companies, many companies believe they will be in existence *in perpetuity*—otherwise known as a *going concern*. For this reason, we must estimate a value for the company in perpetuity. This is done by changing assumptions for the short-term forecast period to a long-term expectation and applying a perpetuity-based formula. Typical changes would include switching the growth rate to a stable expectation, using maintenance capital expenditure assumptions rather than specific plans, altering the short-term working capital expectations, and so on. Figure 2.2 is a graphical representation of the difference between the forecast and terminal periods. We will look at the details of calculating a terminal value in Chapter 9, but for now we should understand that there will be a distinction between the forecast period and the terminal value.

HISTORICAL TIME PERIODS

Whereas the forecast and terminal periods will be the focus of analysis, the basis for these items is often rooted in historical data. It is convenient to store this data

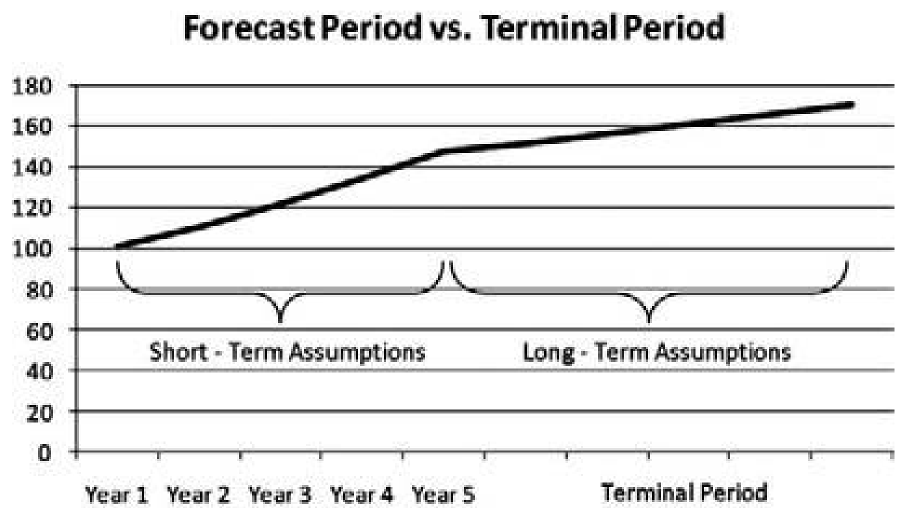


FIGURE 2.2 In the forecast period, short-term assumptions are used, whereas in the terminal period we will switch variables to long-term, stable assumptions.

in the financial model since we may use it for multiple reasons. Historical income statement data can give us important information such as revenue growth rates, whereas balance sheet data can show us historical capital structure ratios. Often, historical, audited annual financial statements going back at least three to five years are used for these purposes.

Where multiple years of data is useful to calibrate performance assumptions, a thorough analysis looks at *trends* within a year, particularly since many companies experience cyclicality due to the nature of their business or industry. For instance, agribusinesses have revenues and costs that correspond to the harvest season of the crops that they grow and sell. For this reason, we would want to examine historical data and perhaps structure our forecast period to a level of detail that captures the cycle. Adjusting the analysis for cyclicality can help ensure that there are no periods of stressed cash flow that causes liabilities to go unpaid.

Beyond normal operational trends, we should also be concerned by performance trends caused by unusual market or idiosyncratic forces. What if the industry or region is experiencing a negative trend in performance? How has a change in management affected the company's performance? To help flush out these details, we may look at the last 12 months (LTM) of a company's performance in detail. Although it is common to use the LTM, do not feel trapped by convention. If management changed, or if there was a severe industry dislocation further back, it might make sense to adjust a detailed historical analysis to coincide with such events.

Besides using historical data to assist in calibrating the assumptions for our model, we will also use the most recent audited financial statements as a basis for our projections. If, for instance, we believe that the first year's growth of a company's forecast period is 8%, then we could take the last audited revenue figure and grow

	A	B	C	D	E	F	G
1	**Income Statement**						
2					Projected ---->		
3				12/31/2007	12/31/2008	12/31/2009	12/31/2010
4							
5		Sales units		100.00	105.00	110.25	115.76
6		Sales Price		2.00	2.10	2.21	2.32
7		Sales Revenue		200.00	220.50	243.10	268.02
8		Cost Units		0.50	0.53	0.56	0.60
9		Cost of goods sold		70.00	70.62	64.49	71.76

FIGURE 2.3 The information from 12/31/2007 is hard coded, historical information, whereas data to the right is based on percentage expectations.

it by 8%. The process of using historical information for calibration and as a basis for projection is demonstrated by Figure 2.3.

EVENT TIMING

Thus far we have discussed time on a macro level; however, date and timing issues also permeate throughout specific events within the forecast period. Such events could include debt issuance, capital expenditure, intangible acquisition, and so on. For each of these events there are specific dates and timing that initiate or terminate sub-events. For instance, assume a company anticipates purchasing a warehouse one year from the beginning of an analysis. During the first projection year there would be no capital expenditure related to this event. However, on the expected purchase date gross fixed assets would increase and either cash decreases or some other liability financing takes place. One period from the purchase of the warehouse, a depreciation calculation of some type would take place. The depreciation would continue every period until the asset is fully depreciated. At that point, the asset and its accumulated depreciation is kept on the books until it is removed by disposal. Figure 2.4 is a conceptual depiction of the event timing for a single capital expenditure. In Chapter 5 we will examine this concept further, but it is important now to realize that we must build in functionality to monitor and alter outcomes based on these sub-events.

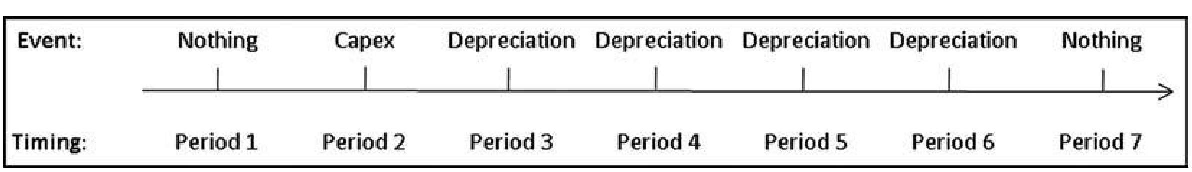


FIGURE 2.4 Many items such as capital expenditures have specific sub-events that require the timing to be monitored.

MODEL BUILDER 2.1: DATES AND TIMING ON THE ASSUMPTIONS SHEET

1. This first Model Builder for dates and timing will focus on the assumptions sheet. Go to the Assumptions sheet and enter the text **Dates, Timing, & Global Assumptions** in cell B3. This will be a label for the relevant date and timing variables.
2. In cell B8, enter the text, **Last Historical FY**. *FY* stands for *Fiscal Year*. In cell D8, enter a proxy date of **12/31/2007**. This will be the latest date that we have audited financial information from. For instance, the balance sheet that we will use in our analysis will be as of 12/31/2007. Also, name cell D8 **inputs_LastFY**.
3. In cell B9, enter the text, **Current FY**. In cell D9, enter a proxy date of **12/31/2008**. This will be the first projection period that we will work with. Also, name cell D9 **inputs_CurrentFY**.
4. In cell B10, enter the text, **Periodicity**. We will very shortly create our first data validation list to toggle between input data. In this case, we will create a data validation list to switch the model between various periodicities. Data validation lists are explained in detail in this chapter's Toolbox; however, we should take a moment to discuss the management of these lists. The actual values for the lists will be stored on a separate sheet that will be hidden once we complete the model. Let's create this sheet right now by changing the name of Sheet2 to **Hidden**.
5. Go to the Hidden sheet and enter the text **Hidden** in cell A1. Still on the Hidden sheet, enter the following text in the corresponding cells:

   A3: **lst_Periodicity**
   A4: **Annual**
   A5: **Semi-Annual**
   A6: **Quarterly**
   A7: **Monthly**

6. Name the range A4:A7 **lst_Periodicity**. Note that cell A3 is merely a label for the list that we have named below. Such a system, where the name of a named range is easily viewable, helps in the development and adaptation of the model.
7. In the following cells on the Hidden sheet enter the corresponding values:

   B4: **12**
   B5: **6**
   B6: **3**
   B7: **1**

8. Do not worry if you are looking at the complete model and a cell seems to be missing on the Hidden sheet. There is some functionality that we have left off the Hidden sheet, in cell B8, that we will come back to later.

9. Go back to the Assumptions sheet. In cell D10, create a data validation list using the named range **lst_Periodicity**. If creating data validation lists is unclear or new to you, refer to this chapter's Toolbox at this point. Name cell D10 **inputs_Periodicity** and select **Annual** from the list as the starting value.
10. In cell B11, enter the text **Months Projected**. In cell D11, enter a proxy value of **60**. This section will allow the user to adjust the forecast period duration. We will see later that this will also help us identify the terminal period. Name cell D11 **inputs_MoProj**. With this done, we have finished the core dates and timing for the Assumptions sheet. We will now take the inputs on the Assumptions sheet and put them into action on a new sheet.

MODEL BUILDER 2.2: INTRODUCING THE VECTORS SHEET

1. Change the name of Sheet3 to **Vectors**. You may want to move the sheet to the left so it is placed between the Assumptions and the Hidden sheets. On the Vectors sheet, in cell A1, enter the text **Vectors**.
2. In cell D10, enter the following formula:

   =inputs_LastFY

   This cell references the last historical date that we entered on the Assumptions sheet.
3. In cell E10, enter the following formula:

   =inputs_CurrentFY

   This cell references the current date that we entered on the Assumptions sheet. Notice that this is a rare instance where we violated the precept of keeping the same formula for each continuous row or column. In this case, we should never have to adjust these two dates since the historical date is there for a reference and column E will always contain the current date of the analysis.
4. Prior to completing the next logical cell, cell E11, we need to go back to the Hidden sheet to add some functionality. On the Hidden sheet in cell B8, enter the following formula:

   =OFFSET(Hidden!$B$3,MATCH(inputs_Periodicity,lst_Periodicity,0),0)

   This is a classic OFFSET MATCH combination of functions. The technique is described in the Toolbox section of this chapter if you are unfamiliar with either function or the pairing of the two functions together. In this case, we are offsetting the top of the list of period values on the Hidden sheet by matching the periodicity label that a user selects from the data validation list on the Assumptions sheet. For example, when a user selects Annual for the periodicity on the

Assumptions sheet, then this cell will return a 12; when a user selects Monthly, this cell will return a 1. Still on the Vectors sheet, name cell B8 **ctrl_Periodicity**. We will need this cell momentarily since its value is the number of months between periods based on the selected periodicity from the Assumptions sheet.

5. The next cell we will work on is going to contain a much more complex formula than we have seen thus far. If any of the functions that are used are unclear or new to you, go to the Toolbox section of this chapter, where they are explained in detail. Otherwise, back on the Vectors sheet, enter the following formula in cell F10:

   =IF(E10="","",IF(EDATE(inputs_CurrentFY,inputs_MoProj+12)>(EDATE(E10,ctrl_Periodicity)),EDATE(E10,ctrl_Periodicity),""))

   Let's break up this formula section by section. The formula begins with an IF function to test whether the prior cell was blank. Double quotes ("") are a way to check whether a cell is blank. There are other functions, but this is simple enough. The formula checks the prior cell in time to the left to see whether it is blank. If it is, then for presentation reasons, we should not have a value show up in the cell to the right. However, if there is a value in the prior cell, we may want a value in the next cell. This value is determined by first testing to see whether we are within the forecast period. The test is accomplished by checking the date of the terminal period and making sure that it is greater than the prior period's date increased by the number of months between periods. If this test returns a TRUE, then the current date is the prior period's date increased by the number of months between periods using the EDATE function. If it is FALSE, then the cell is kept blank using double quotes. If you are unfamiliar with the IF and/or EDATE functions, refer to the Toolbox section of this chapter for additional explanation. Otherwise, copy and paste this formula over the range F10:Z10.

   Astute readers will notice that on the Assumptions page we indicated a 60-month projection period, yet a date that is 72 months from the last historical fiscal year appeared. This is because that final period is the terminal value period. Often a confusing concept, we need to have a period to enter many of our terminal value assumptions. In reality, this is not a true period such as the ones in the forecast period range, but it is necessary so we can set assumptions for the terminal value.

6. For visualization and referencing purposes, we might want to have labels indicating whether we are in the forecast period or the terminal period. To do this, enter the following formula in cell D9:

   =IF(D10=inputs_CurrentFY,"Projected —->",IF(EDATE(inputs_CurrentFY,inputs_MoProj)=D10,"TV Year",""))

   This formula uses IF functions to test the dates in row 10 for the corresponding column in row 9. If the date in row 10 is the current fiscal year, then a label that indicates the start of the projection is returned. If the date in row 10 is equal to the current fiscal year increased by the number of months in the projection period, then a terminal period label is returned. Otherwise the cell is kept blank by entering double quotes. Copy and paste this formula over the range D9:Z9.

SUMMARY OF DATES AND TIMING

We are now done with the core dates and timing functionality. Some of the functionality that we have implemented is incomplete at this point. While it is interesting to see the dates change by using a drop-down list and hide or disappear depending on our forecast period, our goal is valuation. If we try to maintain a conceptually based flow, once we have the shell of our model created from dates and timing, we should begin to fill it in. One of the most influential factors of a firm's valuation is the earnings ability of the company. For this reason we will implement revenue generation and the income statement in Chapter 3.

TOOLBOX

This Toolbox will cover a number of Excel tools that allow us to control user entry, anticipate variable assumptions, and automate lookups. These include:

- Data validation lists
- OFFSET function
- MATCH function
- OFFSET MATCH combination
- VLOOKUP function
- EDATE function
- EOMONTH function
- IF function

Data Validation Lists

Good financial modelers work like computer programmers by reducing error before it can enter the system they are creating. One method is to limit a model user's possible entries. This can be achieved in a few ways, each having its own advantages and disadvantages. The first one we will explore is creating a data validation list.

When a data validation list is specified to a cell, it provides a selection of possible entries in a list format when the cell is selected. The list is based on a list that exists in a different range in the workbook. Figure 2.5 shows the results of creating a data validation list in cell D3, using data from B2:B5.

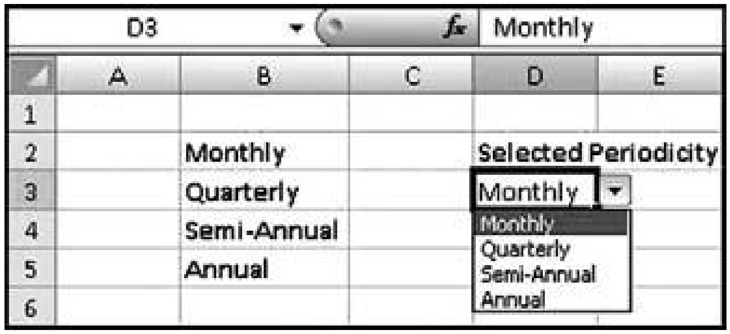


FIGURE 2.5 Data validation lists allow a user to select a value from a list of possible values that the model builder creates.

To create such a list in Excel 2003, go to the Data menu and select **Validation**. From the Validation dialogue box under the Allow label, select **List**. Under the Source label, put the cursor in the box and then select a range on the sheet and then press **OK**. An identical process can be done in Excel 2007 by going to the Data tab and pressing the **Data Validation** button. The Validation dialogue box should look identical to Figure 2.6.

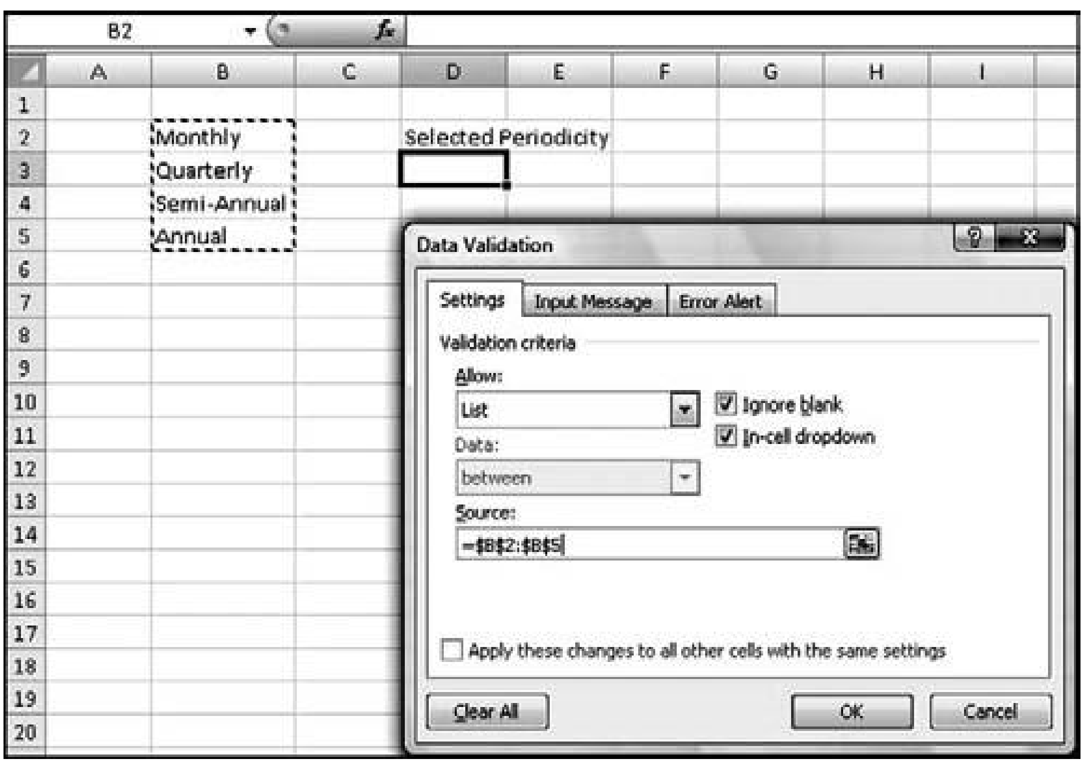


FIGURE 2.6 The Data Validation dialogue box allows a user to designate the cell where the list will be created and the reference for the items that will be contained on the list.

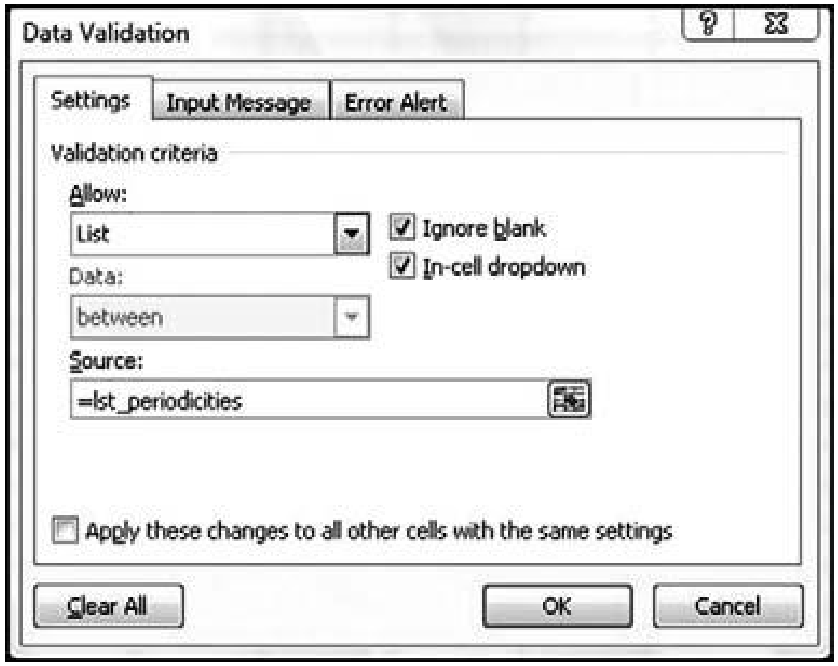


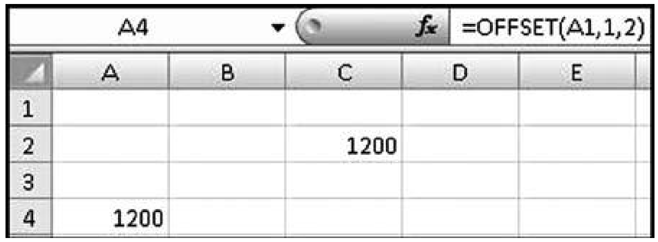
FIGURE 2.7 Named ranges must be used in the Data Validation dialogue box if the user wants to store lists on separate sheets from the cell containing the data validation list.

A very important nuance of using data validation lists is that if the source list remains unnamed, then the source list must be on the same sheet as the cell that the validation list is being created in. Try to create a data validation list on Sheet1 using a source list from Sheet2. In neither Excel 2003 nor 2007 will you be able to select a different sheet for the source list. This can be easily overcome by naming the source list and then using the named range as the source. Make sure to still use an equal sign; otherwise, the name that was entered in the source list will appear in the cell! See Figure 2.7 for an example of using a named range in the source field of the Validation dialogue box.

OFFSET

Financial modelers are consistently tasked with manipulating data throughout their models. Much of this is nonmathematical, but rather more administrative. The OFFSET function is a reference function, which is incredibly useful for moving and referencing data within a model. The function requires the following parameters:

=OFFSET(**reference cell, number of rows from reference cell to move up or down, number of columns from reference cell to move left or right**)



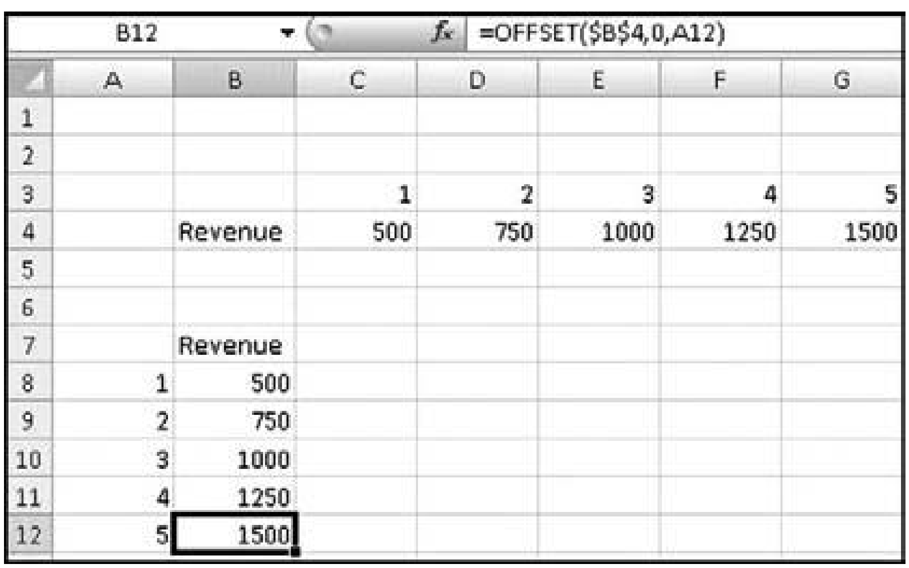
	A	B	C	D	E
1					
2			1200		
3					
4	1200				

FIGURE 2.8 The OFFSET function is a reference function to return values based on numerical parameters.

Figure 2.8 is an example with OFFSET returning a value by referencing cell A1 and offsetting it by 1 row and 2 columns. This reference returns the value from cell C2, which is 1200. When positive numbers are used for the rows, then OFFSET moves down from the reference location, while negative numbers will move up from the reference location. Similarly, when positive numbers are used for the columns, then OFFSET moves right from the reference location while negative numbers will move left from the reference location.

OFFSET is better used with arrays or lists of data. In Figure 2.9, there are revenue figures organized horizontally in row 4. In order to rearrange that data vertically, the OFFSET function is used with the assistance of a series of numbers that correspond to the reference location.

One of the more confusing aspects of using the OFFSET function is where to set the reference location cell. OFFSET is best used by starting the reference



	A	B	C	D	E	F	G
1							
2							
3			1	2	3	4	5
4		Revenue	500	750	1000	1250	1500
5							
6							
7		Revenue					
8	1	500					
9	2	750					
10	3	1000					
11	4	1250					
12	5	1500					

FIGURE 2.9 The OFFSET function is valuable to reference data in different directions and orders.

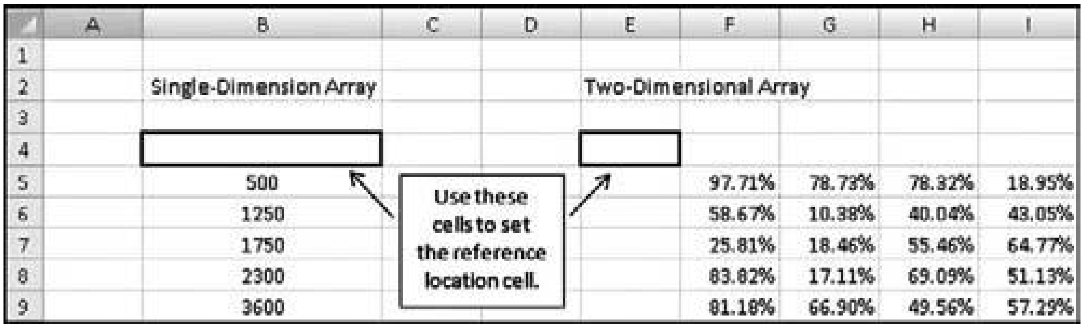


FIGURE 2.10 The starting reference point can be confusing for users new to the OFFSET function. When using OFFSET to reference single-dimension lists, start at the top. For two-dimensional sets of data, start at the corner.

location at the top of a single-dimension array or at the upper-leftmost corner of a two-dimensional array. Although we could use OFFSET anywhere on the sheet to reference the data in a single- or two-dimensional array, the most efficient locations are the ones closest to the data described earlier. See Figure 2.10 for a graphical representation of the best places to set the reference location.

One final aspect of the OFFSET function to notice is that it accepts numbers for the number of rows and columns to move from the reference location. To prepare for how we will use this function with another function, think about the inconvenience it would cause if we always had to provide the OFFSET function with numbers. Conveniently, the next function in this chapter's Toolbox is a function that converts more understandable inputs into numbers that OFFSET can accept.

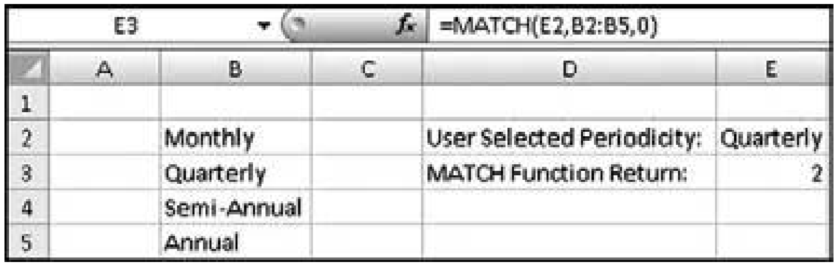
MATCH

On its own, the MATCH function is incredibly easy. It returns the ordinal value of a lookup value compared to a list of values. The entry parameters for the MATCH function are:

> =MATCH(value to be looked up, range of cells that could contain the value being looked up, type of match)

Since this function's parameters may need to be reread a few times, it is probably best explained by looking at an example. In Figure 2.11 we have a list that contains the possible periodicities that a model could be set to: Monthly, Quarterly, Semi-Annual, and Annual. If a user provided the periodicity that she was looking for, the MATCH function would return the ordinal number from the list. So, if the user typed **Quarterly** in a separate cell and designated that cell as the lookup value and the list of periodicities as the list of values, then the MATCH function would return a 2.

The MATCH function itself requires three parameters: the lookup value, the lookup array, and the type of match. The first parameter is the value that the user



E3 =MATCH(E2,B2:B5,0)

	A	B	C	D	E
1					
2		Monthly		User Selected Periodicity:	Quarterly
3		Quarterly		MATCH Function Return:	2
4		Semi-Annual			
5		Annual			

FIGURE 2.11 The MATCH function returns a 2 because Quarterly is the lookup value and the second item on the lookup array.

is trying to look up. This can be text, dates, or a number. The second parameter is the lookup array or the list of values. The final parameter that the MATCH function requires is the number 0, 1, or –1. This parameter designates the type of match that takes place. When working with text or exact values that can be found on a list, the 0 should be used since this parameter signifies an exact match. When a lookup is being attempted with a number that can fit within a range of numbers, the 1 or –1 should be used. A –1 indicates that the ordinal position of the smallest value that is greater than the lookup value will be returned. A 1 indicates that the ordinal position of the largest value that is greater than the lookup value will be returned. These last two options for match type are very useful when presented with buckets or stratifications of data that require values to be looked up against.

OFFSET MATCH Combination

We will definitely find utility for the OFFSET and MATCH functions on their own, but the real power of these two functions is when they are combined to find values or reference cells. Recall that the OFFSET function accepts numbers for the number of rows and columns to move away from a reference cell. It would be cumbersome to always have to provide OFFSET numbers as entries. Conveniently, we learned that the MATCH function returns numbers based on ordinal position. Let's take a look at an example of the OFFSET MATCH combination, first in a decomposed form and then combined.

In our example we are going to try to return the number of months between periods, depending on the periodicity that the user selects. For instance, if the user selects **Monthly**, the return should be 1 month between periods. If the user selects **Annual**, the return should be 12, and so on. To set this up, we need a list of the possible periodicities and the corresponding number of months between periods. Figure 2.12 shows this initial setup.

In a separate cell, we could create the functionality by just using the OFFSET function. If we offset cell C1 by 1 row and 0 columns, a 1 would be returned. If we offset cell C1 by 2 rows and 0 columns, a 3 would be returned, and so on. So, we could build in functionality where the user provides a number for the periodicity and

	A	B	C
1			
2		Monthly	1
3		Quarterly	3
4		Semi-Annual	6
5		Annual	12

FIGURE 2.12 To demonstrate the utility of OFFSET MATCH, we will use a periodicity-related example.

the OFFSET function returns the number of months between periods. Figure 2.13 depicts this addition.

Now many readers will say to themselves, in the current state this seems entirely useless and makes the process more complicated. If a user had to remember the order number of the periodicity, he might just as well enter the number of months between periods. The only advantage this setup currently has is it restricts users to four possible periodicities, rather than allowing the user to create custom periodicities that the model builder did not anticipate. However, we can make the process much more intuitive by introducing the MATCH function into the process.

Rather than having the user enter a number to return the number of months between periods, it would be better to allow him to enter something with more context, such as a description of the periodicity. We can alter the previous example by writing in the name of the periodicity that we want in cell E3. In cell F3, we could use the MATCH function by using cell E3 as the lookup value and the list of periodicities in range B2:B5 (note that this range was named **lst_periodicities** earlier) to return the ordinal location of the desired periodicity. Keep in mind that a 0 match type was used to designate an exact match. This will return a number from 1 to 4

E5 =OFFSET(C1,E3,0)

	A	B	C	D	E	F	G	H
1								
2		Monthly	1		Selected Periodicity			
3		Quarterly	3		4			
4		Semi-Annual	6		Number of Months Between Periods			
5		Annual	12		12			

FIGURE 2.13 While not complete, we can see in this example that OFFSET uses a number to offset the top of the list and return the correct number of months between periods.

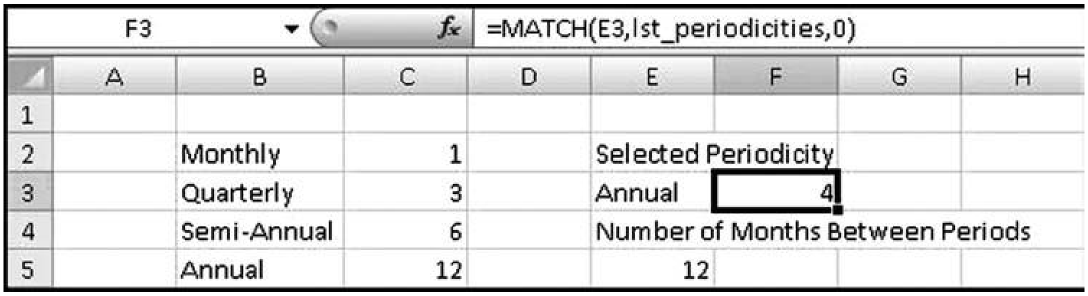


FIGURE 2.14 The final addition is to use the MATCH function to derive the number that is used by the OFFSET function. Combined with a data validation list, the user can now select a periodicity based on name and have the number of months between periods easily returned.

depending on the desired periodicity and the order of the list. The altered example is shown in Figure 2.14.

Now we can connect the row reference for the OFFSET function to the return from the MATCH function in cell F3. Look in the formula bar in Figure 2.15 to see this quick change.

We can clean up this process in two ways:

1. It is precarious to have users type in the name of the periodicity that they want since if they make a misspelling or use different semantics the MATCH function could break down. To prevent such error, we should implement a data validation list in cell E3 that is based on the periodicity list from range B2:B5.
2. We do not need an additional cell for the MATCH function. We could replace the row reference in the OFFSET function that is currently set to cell F3 with the entire MATCH function that is in cell F3.

Figure 2.16 shows the completion of both of these efficiencies.

A number of discussion points are raised by this technique. The first is, why not just use the VLOOKUP function, which provides similar functionality, but with one function? While VLOOKUP is a powerful function, the major disadvantage is that the data must be contained in a continuous block or table of data. With OFFSET

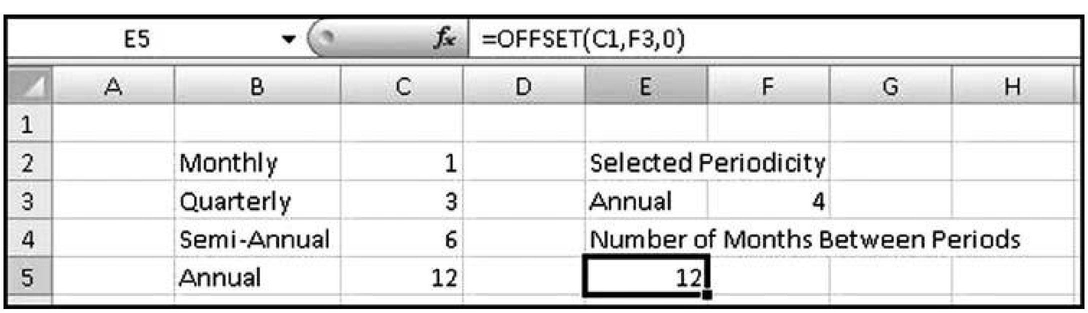


FIGURE 2.15 The OFFSET function is connected to the MATCH function's return.

E5 =OFFSET(C1,MATCH(E3,lst_periodicities,0),0)

	A	B	C	D	E	F	G	H
1								
2		Monthly	1		Selected Periodicity			
3		Quarterly	3		Annual			
4		Semi-Annual	6		Number of Months Between Periods			
5		Annual	12		12			

FIGURE 2.16 We can clean up the two separate cells by combining the functions.

MATCH, we can create our lists anywhere and set the OFFSET in a completely different cell and/or sheet location. Additionally, VLOOKUP works only as its name implies: vertically. This means that if we wanted to implement a dual lookup, where we are looking up both vertically and horizontally, we would run into trouble. The OFFSET function can accept another MATCH function for a column lookup to pinpoint data in two-dimensional data sets. The final limitation is that VLOOKUP is limited in its ability to work with imperfect matches, such as trying to match 3.8 against the list 3,4,5. VLOOKUP would return 3. The MATCH function can handle more types of imperfect matches than VLOOKUP.

VLOOKUP

Although the VLOOKUP function was not used in this chapter, it is frequently used by financial modelers, and therefore should be explained. The *V* in VLOOKUP stands for *vertical*. Pairing the words together we have a function that will return a value by looking at information in a vertical list. The entry parameters for VLOOKUP are:

> =VLOOKUP(value to be looked up, continuous range of all values with the vertical list in the leftmost column, the column number from the lookup column where the return value is located, a TRUE or FALSE to determine the match type)

As with many preliminary explanations in this book, a first read-through can be confusing. It's best to show VLOOKUP within the context of an example. Let's use an example similar to the one from the OFFSET MATCH combination. Figure 2.17 shows the setup.

In this example, we have the list of periodicity names in range C3:C6 and the corresponding number of months between dates in range D3:D6. While it cannot be seen from the figure, there is a data validation list in cell F4. The VLOOKUP function is entered in cell F6. The first parameter (the value to be looked up) is the user-selected periodicity name (cell F4). The range that is required for the VLOOKUP is C3:D6, which is the second parameter entered. Next, the function needs to know which

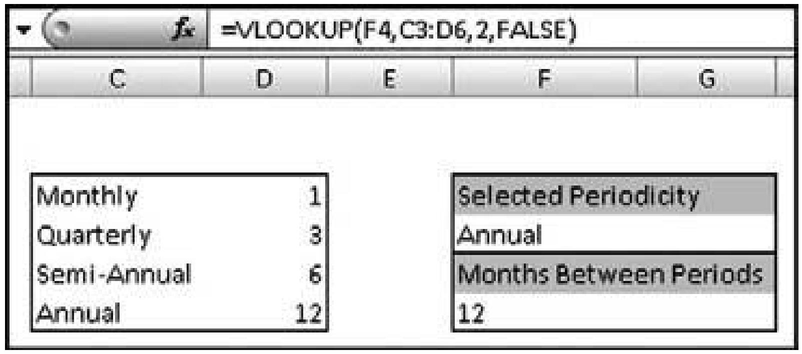


FIGURE 2.17 The VLOOKUP function is an alternative to the OFFSET MATCH combination; however, it is less flexible and more cumbersome to use with complex lookups.

column to provide the results from the range that was just specified. In this case it is column 2, which is hard coded in the formula. Finally, similar to the MATCH function, we need to specify whether our lookup value will be exactly matched to the list of possible values or approximately matched. In this case, we want an exact match, since the word *Annual* can be found exactly as it is spelled in the range C3:C6. Exact matches are designated by entering FALSE as the last parameter in the function. Many users new to VLOOKUP get odd results because they are trying to implement an exact MATCH, but leave the last parameter blank. If this parameter is omitted, the default setting is TRUE, which can return incorrect results.

EDATE

Realizing the importance of date functionality, Excel developers created the EDATE function. This function takes a starting date and a numerical entry for months, and returns a date based on those two parameters. For instance, if the starting date were October 1, 2009, and the numerical entry were 3, the date returned would be January 1, 2010. The function accepts parameters in the following way:

=EDATE(start date, number of months from start date)

Figure 2.18 shows two uses of the EDATE function. The first one uses a positive number to return a date in the future, whereas the implementation below that example uses a negative number to return a date in the past. Notice that there were no hard-coded values within the EDATE function. This is an important habit to get into to maintain flexible modeling. We can also begin to see that the number that is referenced for the number of months from the start date can be dynamic itself. That number can be changed by other functionality, which would in turn change the EDATE return.

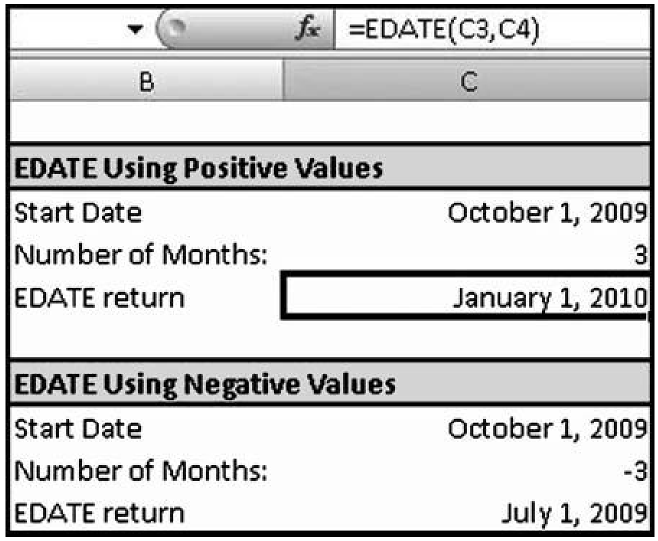


FIGURE 2.18 The EDATE function can accept positive or negative values to return a date in the future or past.

There are three important points to keep in mind when using the EDATE function:

1. *The parameters entered are very specific*. The date must be in serial format if it is directly entered into the formula. This means that if you try to put **10/1/2009** directly in the formula, Excel will think you are trying to divide 10 by 1 by 2009. Also make sure that the value entered to move from the start date is in months. This cannot be changed, but it can be manipulated to work in quarterly, semi-annual, or annual periodicities, as shown earlier.
2. *In order for EDATE to work, the Analysis Tool Pak add-in must be installed*. Otherwise, a #NAME? error will be returned, which will populate through any references. If you get an advanced model with multiple #NAME? errors, a good troubleshooting technique is to install the Analysis Tool Pak add-in.
3. *EDATE returns a date exactly the number of months from the start date*. This means that there is no differentiation between 30- and 31-day months. For example, if the start date is on the 15th and a 1 is used as the number of months from the start date, the return date will fall on the 15th regardless of the starting month's number of days.

For those creating models with settlement in mind or other date functionality, there is a function similar to EDATE that we will look at next.

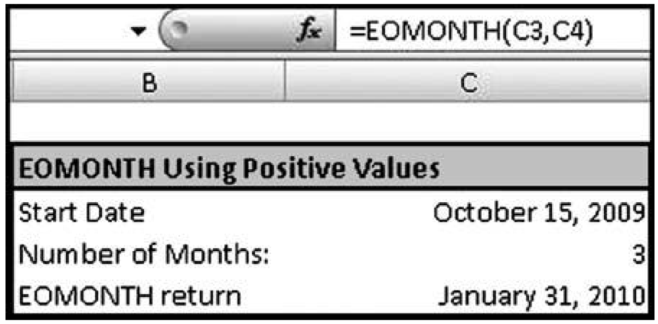


FIGURE 2.19 EOMONTH always returns the last day of the month.

EOMONTH

The EOMONTH function is virtually identical to the EDATE function, with the difference being the day of month that gets returned. EOMONTH returns the last day of the month that is the specified number of months from the start date. The entry parameters are the same as EDATE:

EOMONTH(start date, number of months from start date)

To really show the difference, let's use 10/15/2009 as a start date and enter a **3** as the number of months from the start date. In Figure 2.19, we can see that instead of returning 1/15/2010 as EDATE would, EOMONTH returns 1/31/2010.

IF

Many readers are used to IF functions, but we should formally cover them in case there is any confusion. An IF function has one of two possible returns based on a conditional test. In normal-speak, that means we will devise some sort of test and depending on the outcome of that test return a value. The value could differ if the outcome of the test differs. We have quite a bit of flexibility in creating the test, but it must be a *conditional* test—a test that returns either a TRUE or FALSE depending on a conditional operator. What is a conditional operator? There are many. The conditional operators seen in Figure 2.20 are the most common ones in Excel.

To use a conditional operator, you can put it between two values, such as 3 < 5. In this case, the translation of that statement is "three is less than five." Now, imagine that we want to test that statement. We can write:

=IF(3 < 5

Although this formula is incomplete, we are telling Excel that we want to test the condition 3 < 5. In this case it is TRUE. If the statement is TRUE, then we might

= Equal To

> Greater Than

< Less Than

>= Greater Than or Equal To

<= Less Than or Equal To

<> Not Equal To

FIGURE 2.20 Conditional operators help build conditional tests.

want a value to be entered in the cell where this formula resides. If the statement is FALSE, then we might want a different value entered in the cell. We could write:

=IF(3 < 5,"OK","ERROR")

Now the cell would have a text VALUE of "OK" since the statement is TRUE. IF functions return the first value that is after the conditional test if the conditional test is TRUE and the second value if the conditional test is FALSE.

Keep in mind that IF functions are very flexible. The conditional tests can compare values, dates, and text. They can also be formulas compared to each other. Similarly, the values that are returned can be numbers, text, dates, or formulas that calculate numbers, text, or dates.

We can also use IF functions in an intermediate fashion by *nesting* them. This means that we can test more than just one condition. This is done by writing an IF function and then writing another IF function if the first IF function is FALSE. For example:

=IF(A1>B1,"OK",IF(A1>A2,"OK","ERROR"))

This formula tests the value in cell A1 and returns "OK" if it is greater than the value in cell B1. If that statement is FALSE, then cell A1 is compared to cell A2, and "OK" is returned if that statement is TRUE. If all of the conditional tests are FALSE, then "ERROR" is returned. You can nest up to eight IF functions.

3

Revenue, Costs, and the Income Statement

The firm's ability to generate revenue beyond costs is one of the most important components to a valuation. This excess revenue creates value to debt holders in the form of interest payments, or to equity holders in the form of dividends, or kept internally, which also yields return for equity holders in the form of capital appreciation. If a company has a decline of revenue or has none, then it must pay costs with other sources. Typically, some type of short-term facility, long-term loan, or equity infusion would be required to meet these costs. If there is a continued lack of revenue generation, then the liabilities of a firm can grow beyond the assets and the company could technically be classified as defaulted. Given the critical nature of generating revenue beyond costs, a significant amount of time should be spent analyzing the revenue and cost assumptions that go into a model and the methodologies employed for projections.

Once a growth analysis is complete, it's equally important to have a practical implementation of the various revenue and cost assumptions in the model. This is done by creating a flexible scenario selector system and adhering to standard accounting methods through the creation of an *income statement*. Whereas the revenues, costs, and income statement will provide key insights to the earnings of the firm, we will find that they are inextricably linked, both conceptually and technically, to the capital structure of the firm. For this reason, we will cover a majority of the earnings concepts in this chapter, but revisit them later in the text after going through the capital structure and balance sheet.

REVENUE

We should start with one of the most basic goals of a firm, generating revenue. *Revenue* is any inflow or expected inflow of funds based on the sale of a product or the performance of a service by a company. We should examine revenue through an accounting lens. When an item is sold or a service completed, a receivable is generated, which can be paid immediately with cash or left as a receivable and paid over a short period of time. It's important to note that revenue should be

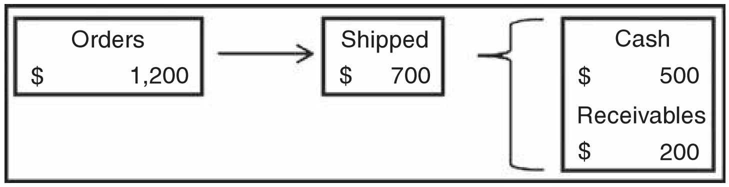


FIGURE 3.1 Even though $1,200 worth of goods were ordered and considered sold, the only revenue that we should recognize is the $700 that was actually shipped. After the other $500 is shipped, then it can be recognized.

recognized only when a product is shipped or a service is completed. Our modeling should use figures based only on these conditions so that our numbers will tie to the company's income statement and balance sheet. Otherwise, we may create an aggressive assumption, which people who are trying to manipulate the books of a firm will attempt on purpose. Figure 3.1 shows the difference between orders and revenue. We would count only $700 in revenue in this example.

Here is a word of caution on the split of revenue from cash and accounts receivable. In some businesses, accounts receivable can make up a disproportionate part of revenue. For instance, a consumer goods company might sell items such as appliances and electronics to customers, and give them the option to pay in cash or through financing. If most of the revenue comes through financing, then the accounts receivable might need to be analyzed in more detail, particularly with concern to nonpaying receivables. We will discuss this further in Chapter 4, when we go through accounts receivable on the balance sheet.

Revenue is also important because many other variables are based on periodic revenue values. For example, for a manufacturing firm that sells chocolate bars, revenue is derived from the sale of the chocolate bars. However, for each chocolate bar sold there are associated costs. If our revenue assumption is inaccurate for any reason, then the cost assumption will also be wrong. Since many items in the model may use revenue or a component of revenue to derive a value, we should spend time making sure our revenue assumption is as accurate as possible.

Estimating Revenue Based on Historical Data

The past may not be the best indicator of future performance, but it does provide data points that we can use to establish a *base case* valuation. In Chapter 2 we discussed the idea of obtaining historical financial information of a company, possibly on an annual basis or the past 12 months, to look for cyclicality. We could store this data in the model that we are creating, or we could maintain a separate source. It really doesn't matter where this data is stored; what matters are the assumptions we derive from this data.

There are multiple techniques for deriving assumptions from historical financial data. In regard to revenue, we are primarily concerned with projecting the expected growth rates. In practice, on Wall Street, there is a range of sophistication employed to derive revenue growth rates. From simple arithmetic averages to complex autoregressive integrated moving averages (ARIMA), growth rates are derived so they can be used for projections. The upcoming Model Builder is slightly different from the previous ones, as we will not be working on the core model. Instead, it focuses on three possible techniques at estimating revenue growth in a separate workbook. The results of the analyses can then be used for modeling.

MODEL BUILDER 3.1: THREE METHODS FOR ESTIMATING REVENUE BASED ON HISTORICAL DATA

This Model Builder will walk readers through the process of estimating growth rates using a variety of methods. The incomplete workbook is named GrowthRates.xls, while the complete workbook is named GrowthRates_Complete.xls. Both are provided on the CD-ROM. The incomplete workbook is provided so readers do not have to enter in the raw data by hand and can focus on the analysis. Just as with the core model, if there is any confusion with the instructions, refer to the complete version for guidance.

1. Open the Excel workbook GrowthRates.xls from the CD-ROM. Look over the sheet to see what data is provided. You should see four separate sections with years and corresponding revenue amounts for each year. An excerpt of the workbook is depicted in Figure 3.2.
2. Our first task will be to determine the annual growth rates for each year. This is a simple process involving a mathematical function. In cell D7, enter the following formula:

   =(C7-C6)/C6

1) Arithmetic Average	
Year	Revenue
2002	150
2003	178
2004	210
2005	247
2006	275
2007	295
2008	310

FIGURE 3.2 The years and associated revenues are provided for each of the four sections of this exercise.

1) Arithmetic Average		
Year	Revenue	Growth Rate
2002	150	
2003	178	18.67%
2004	210	17.98%
2005	247	17.62%
2006	275	11.34%
2007	295	7.27%
2008	310	5.08%

FIGURE 3.3 The first step is to calculate the growth rates between years.

Copy this formula over the range D7:D12. This is a basic growth-rate formula that takes the new amount, subtracts the old amount, and divides that result by the old amount. An easy mnemonic is *New Minus Old Over Old*. Figure 3.3 shows this completed.

3. In cell D13, enter the following formula:

   =AVERAGE(D7:D12)

   The AVERAGE function takes the arithmetic average of the newly created growth rates. For more information on the AVERAGE function, jump to the Toolbox at the end of this chapter.
4. For Excel 2007 users there is a new function called AVERAGEIF that can also provide additional functionality for this analysis. Create a label by entering the text **Include** in cell E5.
5. Enter the following letters in the corresponding cells:

   E7: **N**
   E8: **N**
   E9: **N**
   E10: **Y**
   E11: **Y**
   E12: **Y**

   The *N*'s stand for "No, do not include in the analysis," and the *Y*'s stand for "Yes, include in the analysis."
6. In cell E13, enter the following formula:

   =AVERAGEIF(E7:E12,"Y",D7:D12)

1) Arithmetic Average			
Year	**Revenue**	**Growth Rate**	**Include**
2002	150		
2003	178	18.67%	N
2004	210	17.98%	N
2005	247	17.62%	N
2006	275	11.34%	Y
2007	295	7.27%	Y
2008	310	5.08%	Y
Arithmetic Avg:		**12.99%**	**7.90%**

FIGURE 3.4 The arithmetic mean section is complete using the AVERAGE function. Additional functionality with the AVERAGEIF function is also implemented.

Users of the SUMIF function will recognize AVERAGEIF's strong similarity. The function examines the range E7:E12 to see which ones have a value of "Y" and calculates only the average on the values in range D7:D12, where the column E criterion has been met. This functionality is useful if there are many data points that we are examining and we want to be able to quickly switch the values of a range that we are examining. Otherwise, we would have to redo the AVERAGE function and possibly reorganize the numbers each time we wanted to make a change. For more help on AVERAGEIF, see the Toolbox at the end of this chapter. Also refer to Figure 3.4 for the complete arithmetic average section.

7. Now keep in mind a very important point. Many disagree with using the arithmetic mean for analyzing growth rates. I also disagree with such a use, but am showing the arithmetic mean because it is still used by a number of professionals. I also want to establish an example for a *back test*. Let's test the arithmetic mean by starting with the 2002 revenue and growing that revenue number by the arithmetic mean each period. In cell J5, create a label for this test by entering the text **Back Test**. In cell J7, enter the following formula:

   =C6*(1+$D$13)

   We need to grow this new value by the same mean, so enter the following formula in cell J8:

   =J7*(1+$D$13)

   Copy and paste this formula over the range J8:J12. As shown in Figure 3.5, cell J12 should have a value of 312, which is greater than the last historical value

1) Arithmetic Average				
Year	Revenue	Growth Rate	Include	Back Test
2002	150			
2003	178	18.67%	N	169
2004	210	17.98%	N	192
2005	247	17.62%	N	216
2006	275	11.34%	Y	245
2007	295	7.27%	Y	276
2008	310	5.08%	Y	312
Arithmetic Avg:		12.99%	7.90%	

Notice larger revenue than historically shown for the final year.

FIGURE 3.5 When back tested, the arithmetic mean produces more revenue than we have seen in history and does not account for trending.

recorded. The arithmetic mean here is slightly aggressive. Another concern is that the growth rate appears to be tapering off. The arithmetic mean of all the time periods does not account for this.

8. To help solve some of the problems caused by using the arithmetic mean with growth rates, most professionals use the *geometric* mean instead. The geometric mean is introduced to finance professionals as the *compounded annual growth rate* (CAGR). This can be confusing because it is implemented in various ways. The simplest way to implement CAGR is by solving for the rate, which grows our starting value to the ending value. This can be implemented by entering the following formula into cell D24:

   =(C23/C17)^(1/6)-1

   This formula takes the latest value in time, divides it by the earliest value, and takes that result to the 6th root. We subtract 1 from this entire value to get only the percentage increase each period. Notice that this results in a value that is less than the arithmetic average. We can then implement a similar back test as we did with the arithmetic average. Use the same formulas in range J7:J12, except replace the arithmetic average with the CAGR derived from this example. Do this in range J18:J23. The last back-test figure (cell J18) should be the same as the last year's revenue in the historical data set. Figure 3.6 shows the completed section.
9. Although the previous CAGR is better than the arithmetic average, it misses the intermediate data. We are examining only two data points with the previous CAGR method, the beginning and the end. This implies that there is a smooth growth over time. We should be concerned that the revenue changes are not smooth and occur in some type of pattern or with a trend. In the case of the example data, there is a trend toward reduced growth. We can employ another

2) Compounded Annual Growth Rate (CAGR) - No Intermediate Data			
Year	Revenue	Growth Rate	Back Test
2002	150		
2003	178	18.67%	169
2004	210	17.98%	191
2005	247	17.62%	216
2006	275	11.34%	243
2007	295	7.27%	275
2008	310	5.08%	310
CAGR		12.86%	

FIGURE 3.6 Compounded annual growth rate (CAGR) is a better measure when working with growth rates.

CAGR technique, the geometric mean, which takes these intermediate figures into account. This can be done by entering the following formula in cell D35:

=(D29*D30*D31*D32*D33*D34)^(1/6)

This formula returns the geometric mean, which is the *n*th root of the product of *n* values. This calculation can be simplified by using the PRODUCT function, which multiplies an array of values by each other:

=PRODUCT(D29:D34)^(1/6)

10. We could make the equation even simpler by using the GEOMEAN function built into Excel. The GEOMEAN function takes the following entry parameters:

    =GEOMEAN(values to geometrically averaged)

    If either the PRODUCT or GEOMEAN functions are new to you or require further clarification, jump to the Toolbox at the end of this chapter. Otherwise, let's practice using the GEOMEAN function by entering the following formula in cell G35:

    =GEOMEAN(D29:D34)

    Notice that by including the intermediate values the growth rate decreases even more. Figure 3.7 shows the completed section. This is due to the decrease of the growth rate over time. While the geometric mean is a good technique to employ, there are times when it is not ideal. For instance, change the revenue amount in cell C31 from 247 to 205. The two geometric mean calculations

3) Compounded Annual Growth Rate (CAGR) - Intermediate Data				
Year	Revenue	Growth Rate		
2002	150			
2003	178	18.67%		
2004	210	17.98%		
2005	247	17.62%		
2006	275	11.34%		
2007	295	7.27%		
2008	310	5.08%		
CAGR Math		11.63%	CAGR Formula	11.63%

FIGURE 3.7 The geometric mean takes into account each data point over time.

should return #NUM! errors. This is because our switch in revenue numbers causes one of the growth rates to be negative. The geometric mean calculation and the GEOMEAN function cannot work with negative numbers, although companies can experience negative growth.

11. To expand on our techniques and work with even distressed historical data, we can use *regression* as a tool of measuring growth. Many people shudder at the thought of recalling how to complete a full regression by hand. Thankfully, Excel has many prebuilt regression functions that make running a regression fast and accurate. We will work with one of the many regression features Excel offers, but if you would like to learn more detailed regression functions you can jump to the Toolbox at the end of this chapter.

    Returning to our revenue-growth example in the context of a regression, we should define a few terms. The specific technique we will be focusing on is a *least squares* regression. The heart of performing this regression is the relationship between one variable and one or more other variables. Specifically, a least squares regression seeks to analyze the dependence of a *dependent* variable on one or more *independent* variables. A simple example of a least squares regression is testing the dependence of income on education level. We could try to substantiate through statistics whether the amount someone earns is dependent on her level of education by sampling the population and gathering information on many people's education level and associated income. We could get fancier with this analysis and add in more independent variables such as age groups, geographic location, subjects studied, and so forth.

    Let's get back to our revenue-growth example. What are the dependent and independent variables? The dependent variable is *revenue* and the independent variable is *time*. Just think of the question we are seeking to answer: "How does revenue depend on time?" It would be odd the other way around: "How does time depend on revenue?"

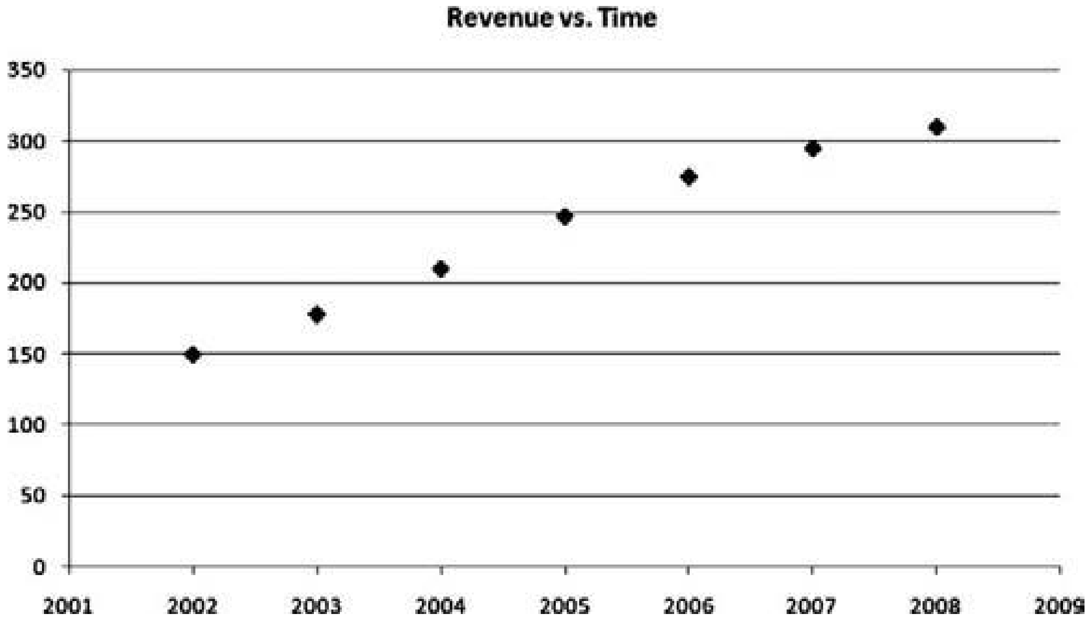


FIGURE 3.8 A least squares regression looks at a dependent and an independent variable.

The best way to visualize this problem is to create a scatter plot of revenue and time, such as Figure 3.8.

A relationship between these two variables can be established by trying to create a line that best fits the data on the scatter plot. The ideal line is one that minimizes the distance between the line and the data points. In Figure 3.9, a trend line has been added that best fits the data set.

How do we create such a trend line? In theory, it is the classic formula:

$$y = mx + b$$

In this equation, m is the correlation coefficient between these two variables and b is the intercept constant. If we plug in an independent data point, we should get a dependent data point that is in line with the established historical relationship. The optimal parameters for this equation are solved through regression. They are the ones that produce the least amount of error, otherwise visualized as the distance between data points and the trend line.

12. We will use the SLOPE function in Excel to save time for our example. The SLOPE function runs a least squares regression and returns the slope. This is a measure of the relationship between the two variables, but not a test for dependency. For growth rates versus time, the dependency is implied, so we can use the slope to understand the relationship. Enter the following formula in cell C46:

=SLOPE(C39:C45,B39:B45)

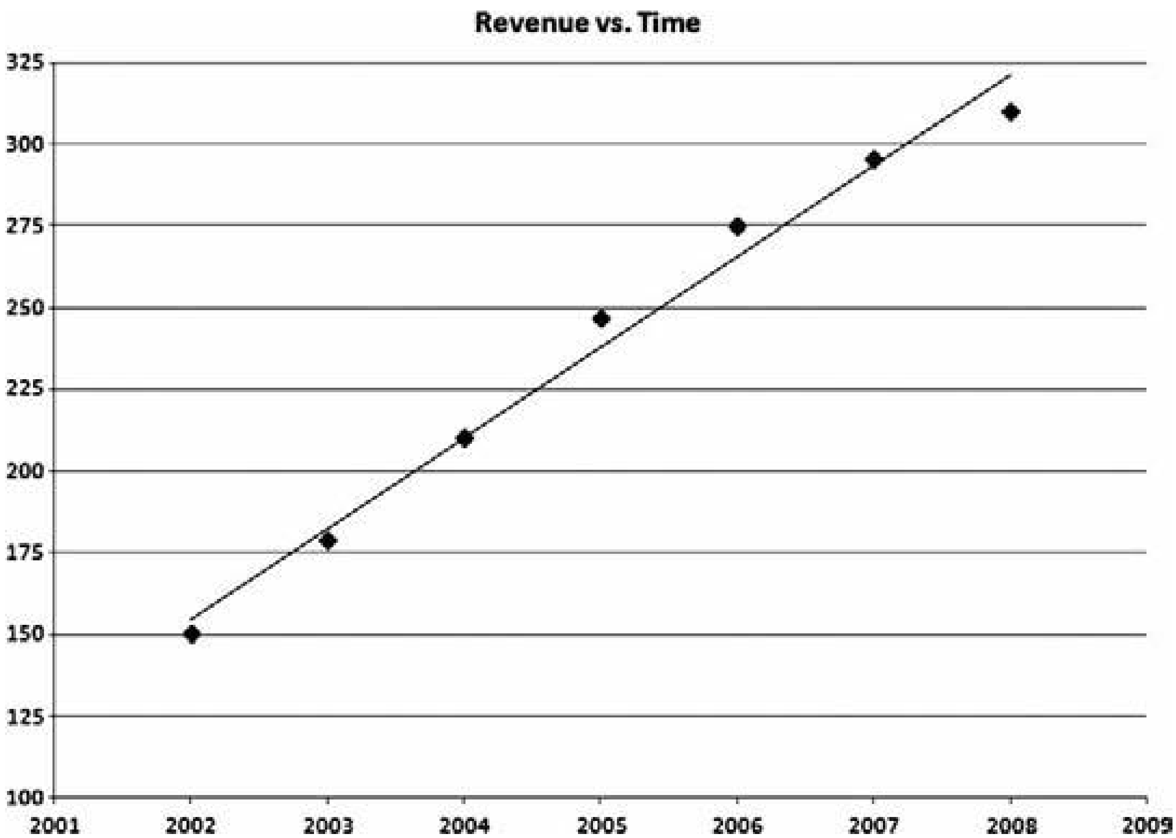


FIGURE 3.9 The distance between data points and an estimated trend line is minimized through the regression methodology.

With the regression function in Excel the first entry parameter is always the dependent value. When you begin typing the SLOPE function, the automatic parameter guide will prompt "known_y's" (see Figure 3.10).

In regression, dependent variables are always referenced on the *y*-axis, whereas independent variables are referenced on the *x*-axis.

To really understand this formula, think about time as our independent variable. In our example, for every unit increase in time we would expect a 27.82 increase in revenue. Therefore, the result of our SLOPE function is *not* the growth rate.

13. We should convert the slope from revenue units to a growth rate. To get the expected growth rate from the slope, we could take the expected increase amount and divide it by the average revenue. In cell D35, enter the following formula:

    =C46/AVERAGE(C39:C45)

    The result of this division is 11.70%, which is comparable to the previous CAGR figure.

	B	C	D
37	**4) Regression**		
38	**Year**	**Revenue**	**Growth Rate**
39	2002	150	
40	2003	178	18.67%
41	2004	210	17.98%
42	2005	247	17.62%
43	2006	275	11.34%
44	2007	295	7.27%
45	2008	310	5.08%
46	=SLOPE(C39:C45,B39:B45)		

FIGURE 3.10 The automatic parameter guide will always ask for the y-axis variables before the x-axis variables.

The methods described in this Model Builder provide insight in determining a base-case figure. Keep in mind there are many other factors that may affect the expected revenue growth rate for a company. We may want to examine specific historical periods if we think they are more relevant than the entire history, we may want to use different time periods for stages of the analysis if we think there will be fundamental changes, or we may have insight into the company's future plans and adjust the growth factor accordingly.

Our method in this Model Builder is purely quantitative, but never underestimate the impact of *qualitative* issues on growth. For example, years back I worked on an Australian pub transaction. Pub revenue was robust, primarily from gambling machines installed in the locations. Two laws were proposed that could affect the pubs: The first was a smoking ban within pubs; the second was a gambling ban. My analysis given these situations included scenarios that estimated the drop in revenue due to a large smoking client base and/or a loss of gambling revenue. In this case, there would be no way to look at historical data and get an accurate growth rate if either or both of the laws were enacted.

Components versus Consolidation

The previous example of pub revenue brings up an interesting point regarding components of revenue. Given the importance of revenue, we might want to take a detailed look at what drives the overall revenue figure. While it's perfectly acceptable to use a consolidated number, where all the revenue components are rolled up into one figure each period, building a model using specific revenue drivers allows

Consolidated vs. Components

Revenue Expectation Each Period from Chocolate Bar Company

	2009	2010	2011	2012	2013	2014
Consolidated						
Sales $	$ 100.00	$ 106.99	$ 114.53	$ 122.64	$ 131.39	$ 140.83
Sales Growth		6.99%	7.04%	7.09%	7.13%	7.18%
Components						
Dark Chocolate Bars ($ per unit)	$ 4.00	$ 4.20	$ 4.41	$ 4.63	$ 4.86	$ 5.11
Growth		5.00%	5.00%	5.00%	5.00%	5.00%
Milk Chocolate Bars ($ per unit)	$ 3.50	$ 3.61	$ 3.71	$ 3.82	$ 3.94	$ 4.06
Growth		3.00%	3.00%	3.00%	3.00%	3.00%
Almond Chocolate Bars ($ per unit)	$ 4.00	$ 4.24	$ 4.49	$ 4.76	$ 5.05	$ 5.35
Growth		6.00%	6.00%	6.00%	6.00%	6.00%
Dark Chocolate Bars (units)	12	12	12	13	13	13
Growth		2.00%	2.00%	2.00%	2.00%	2.00%
Milk Chocolate Bars (units)	8	8	8	8	8	8
Growth		1.00%	1.00%	1.00%	1.00%	1.00%
Almond Chocolate Bars (units)	6	6	6	7	7	7
Growth		4.00%	4.00%	4.00%	4.00%	4.00%
Sales $	$ 100.00	$ 106.99	$ 114.53	$ 122.64	$ 131.39	$ 140.83

FIGURE 3.11 Revenue can be estimated using a simple consolidated approach or a more detailed components methodology.

a model user more flexibility in creating analysis scenarios. We could then try to identify the most relevant and influential drivers and stress those to see the effects on revenue and, ultimately, valuation. For example, in our modeling of pubs we can take a detailed look at revenue by breaking it down into gambling machines, drink, food, and other revenue (such as special events). If we knew of specific revenue estimates for each gambling machine and the number of machines, we could break down the analysis even further into units and revenue per unit.

The same could be done for our chocolate bar company. We could get as specific as identifying individual items sold, the price per item, and the units expected to sell. Ultimately, a components breakdown takes more time, but can be more flexible and valuable in estimating revenue. See Figure 3.11 for a graphical depiction of the difference between using a consolidated and a components methodology.

Fixed, Variable, and Semi-Variable

When using a components methodology, you should keep in mind whether the revenue is fixed, variable, or semi-variable. Fixed revenue is revenue that has a specific dollar amount per period, whereas variable revenue is an amount of revenue that is predicated on another variable, such as units sold. Semi-variable revenue is more difficult to grasp since historical averages may not reflect that semi-variable nature. Specifically, semi-variable revenue has both a fixed and a variable component. An example of semi-variable revenue would be the case of a financial trainer getting paid a training rate of $1,000 for a class of 20 students and $200 more for each additional student. The $1,000 is fixed revenue, whereas the additional revenue is based on each additional student beyond 20.

COSTS

Thus far we have concerned ourselves with only the positive side of the company, revenue. Equally important are the *costs* associated with generating the revenue. Companies run into trouble when their cost structure is too high and sometimes exceeds their revenue. The key to modeling costs is to understand the drivers and relationships behind the costs. This can be simple or very complicated depending on the level of detail and the type of product or company under analysis. For instance, in our chocolate bar company example we could analyze the historical cost of producing each type of chocolate bar. This way we could create a cost percentage for the amount of revenue generated by each chocolate bar type. In Figure 3.12, a standard assumption set is created for the costs of our chocolate bars. The top section is labeled "Consolidated," where percentages of revenue have been estimated. These estimates could be derived from a historical study of cost versus revenue or alternative expectations regarding chocolate bar costs.

We could go further into this analysis by breaking down the ingredients in the chocolate bar and the costs associated with purchasing each of these separately. This would be a pertinent process for food analysts, given the volatility in some food product prices. Figure 3.12 also shows components methodology, where ingredient costs per unit have been projected. We can now assume that certain costs for each chocolate bar may grow at different rates than the revenue growth and/or different rates than each other ingredient. Incidentally, careful readers will notice that the cost percentage of revenue is the same in both the consolidated and the components approach. This was done to show how the two methods can connect, but in practice these two methodologies often lead to different figures since the consolidated approach is less detailed and uses figures with generic assumptions.

Whether we choose a consolidated or a components approach, we can use statistical techniques that we have just learned to help estimate the numbers to use in the projection. We should also briefly discuss a more powerful alternative. In this case, we may be concerned that cacao beans or sugar might have volatile prices. When dealing with items that exhibit volatility, simulation can help manage risk. A simulation in this case could be run in two ways:

1. The quick-and-dirty way would be to simulate price paths for each food product and use a path given a certain confidence level from the distribution of price paths.

	2009	2010	2011	2012	2013	2014
Consolidated						
Cost as % of Revenue						
Dark Chocolate Bar Costs	30.00%	28.92%	27.88%	26.89%	25.93%	24.97%
Milk Chocolate Bar Costs	29.57%	29.03%	28.60%	28.13%	27.62%	27.14%
Almond Chocolate Bar Costs	27.13%	25.96%	24.86%	23.79%	22.75%	21.78%
Components						
Per Unit Costs						
Dark Chocolate Bars						
Cacao Beans	0.80	0.81	0.82	0.82	0.83	0.84
Sugar	0.05	0.05	0.05	0.05	0.06	0.06
Vanilla	0.20	0.20	0.21	0.21	0.22	0.22
Lecithin	0.15	0.15	0.15	0.15	0.16	0.16
Milk Chocolate Bars						
Cacao Beans	0.60	0.61	0.61	0.62	0.62	0.63
Sugar	0.06	0.06	0.06	0.06	0.07	0.07
Vanilla	0.18	0.18	0.18	0.19	0.19	0.19
Lecithin	0.10	0.10	0.10	0.10	0.10	0.11
Milk	0.10	0.10	0.10	0.10	0.10	0.11
Almond Chocolate Bars						
Cacao Beans	0.55	0.56	0.56	0.57	0.57	0.58
Sugar	0.06	0.06	0.06	0.06	0.07	0.07
Vanilla	0.18	0.18	0.18	0.19	0.19	0.19
Lecithin	0.10	0.10	0.10	0.10	0.10	0.11
Milk	0.10	0.10	0.10	0.10	0.10	0.11
Almonds	0.10	0.10	0.11	0.11	0.11	0.12
Unit Sales						
Dark Chocolate Bars	12	12	12	13	13	13
Milk Chocolate Bars	8	8	8	8	8	8
Almond Chocolate Bars	6	6	6	7	7	7
Dark Chocolate Bar Costs	14.40	14.58	14.76	16.18	16.38	16.59
Milk Chocolate Bar Costs	8.28	8.38	8.49	8.60	8.71	8.82
Almond Chocolate Bar Costs	6.51	6.60	6.70	7.93	8.04	8.16

FIGURE 3.12 Costs also can be estimated using a consolidated method or a more detailed components methodology.

2. A better, more correct method would be to create a distribution of firm values based on simulated price paths and use a firm value for the scenario that is associated with a specific confidence level.

The details of a simulation are a book in itself and beyond the scope of this one; however, the key is to understand that some costs will be directly associated with revenue, whereas others might be so volatile that an alternative analysis might be necessary.

Costs directly related to the production of products or services, such as chocolate bar ingredients, are known as *operating* costs. Beyond operating costs are *non-operating* and *irregular* expenses. These expenses could include financing costs such as interest and dividends, or other extraordinary costs such as lawsuit settlements, natural disaster, infrastructure, or, in international situations, expropriation. We will introduce and work with these items in the upcoming income statement section and in Model Builder 3.2; we will go into more detail on them in Chapter 4.

ORGANIZING REVENUE AND COST ASSUMPTIONS FOR SCENARIO ANALYSIS

Rarely are financial analysts asked to produce one expectation for revenues and costs. Many factors can affect both of these topics and managers want to know the results when projections are worse than expected, or better than expected, or perhaps in specific cases such as the legal scenarios surrounding Australian pubs discussed earlier. For this reason, we should implement our revenue and cost assumptions in a dynamic method that allows us to enter in expected cases quickly and vary the results of our analysis.

We will implement two methods to manage our assumptions, a basic one involving just Excel functions and formulas, and an advanced one in Chapter 11, when we learn more about VBA. The basic one is common to many financial models and is known as a *current* or *live scenario* system. This system works by populating the current or "live" scenario with data stored in other sections of the model. Figure 3.13 is a graphical depiction of the process.

In Figure 3.13, the dotted lines represent the interaction between the Assumptions sheet and two parts of the Vectors sheet. The user selects a scenario from a list of scenarios. A formula on the Vectors sheet in the current/live scenario section will reference this selection in a way to pull the correct data from the scenario data that

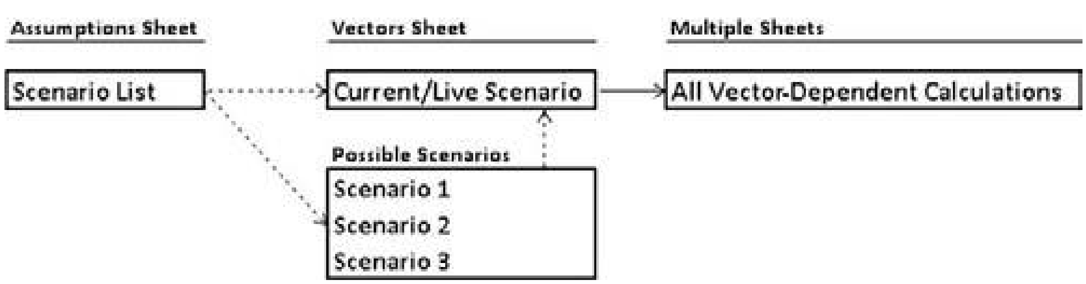


FIGURE 3.13 The user selects a scenario from the Assumptions sheet, which instructs the current/live scenario formula to load up the values from the possible scenarios' data. All calculations are based on the current/live scenario.

is stored underneath the current/live scenario section. All calculations are then based on the data that is in the current/live scenario section. When a user toggles through the scenarios on the Assumptions sheet, the current/live scenario data changes, which then changes linked calculations and ultimately the valuation.

MODEL BUILDER 3.2: INSTALLING AN EXCEL-BASED SCENARIO SELECTOR SYSTEM

1. The data for the possible scenarios will be stored on the Vectors sheet. Go to the Vectors sheet and enter the following text labels in the corresponding cells:

   B3: **Scenarios**
   B4: **Base Case**
   B5: **Upside Case**
   B6: **Downside Case**
   B9: **Live Scenario**

   Name cell B4 **vectors_Case1**, cell B5 **vectors_Case2**, and cell B6 **vectors_Case3**. Also, name range B4:B6 **lst_Scenarios**.
2. We will focus only on revenue and cost assumptions so far, which will be captured when we create the income statement. For this reason, we will enter only assumptions pertinent to the income statement. On the Vectors sheet, enter the following text labels in the corresponding cells:

   B11: **Income Statement Items**
   B12: **Sales Unit Growth**
   B13: **Sales Price Growth**
   B14: **Cost Unit Growth**
   B15: **SGA (% of Revenue)**
   B16: **Op Ex (% of Revenue)**
   B17: **Non-Op Ex (% of Revenue)**

   Just to be clear, rows 12, 13, 14 will contain percentages that represent the growth each period of sales units, prices, and costs. Keep in mind that other rows use the statement "(% of Revenue)," which means that the percentage entered will be applied to the revenue dollar amount for the period. Those are not growth rates. The value of the item that uses "(% of Revenue)" will grow by the sales growth rates though, and should primarily capture items that vary with revenue. Fixed or semi-variable items are poorly captured by this method and may require separate rows for adjustment.

   The next acronym in this section is *SGA*, which stands for *selling, general and administrative costs*. This category encompasses items such as salary, office costs, and other expenses related to the sale of a product or service, such as advertising. All other operating costs that keep the firm's day-to-day operations intact are captured by the Op Ex (Operating Expenditure) row. Expenses incurred that are not part of the core operation of the firm are included in the Non-Op Ex (Non-Operating Expenditure) row. Keep in mind that the Non-Operating Expenditure row does not include concepts such as depreciation, amortization, interest, and dividends. As we encounter those items in later chapters we will explain the theory and implementation.

3. The live scenario section will not have any hard-coded numbers entered as assumptions. Instead the live scenario section will draw its data from scenario data stored below it. For this reason, we should set up areas for the possible scenario data. The labels should reference the Live Scenario labels so we do not have to change each one by hand. Enter the following formulas in the corresponding cells. Note that in the following directions there are multiple cells on the sheet that refer to the same cell from the live scenario section. If any of this is unclear, go to the completed Vectors sheet from the complete model:

   B40: =vectors_Case1
   B71: **=vectors_Case2**
   B102: **=vectors_Case3**
   B42, B73, B104: **=B11**
   B43, B74, B105: **=B12**
   B44, B75, B106: **=B13**
   B45, B76, B107: **=B14**
   B46, B77, B108: **=B15**
   B47, B78, B109: **=B16**
   B48, B79, B110: **=B17**

4. For readability of the column periods, we should also reference the dates for each possible scenario. Enter the following formulas in the corresponding cells. Similar to the previous step, there will be multiple cells referencing the same cell in the live scenario section:

   D40, D71, D102: **=D9**
   E40, E71, E102: **=E9**
   F40, F71, F102: **=F9**
   G40, G71, G102: **=G9**
   H40, H71, H102: **=H9**
   I40, I71, I102: **=I9**
   J40, J71, J102: **=J9**
   D41, D72, D103: **=D10**
   E41, E72, E103: **=E10**
   F41, F72, F103: **=F10**
   G41, G72, G103: **=G10**
   H41, H72, H103: **= H10**
   I41, I72, I103: **=I10**
   J41, J72, J103: **=J10**

	A	B	C	D	E	F	G	H	I	J
40		Base Case			Projected ---->					TV Year
41				12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
42		Income Statement Items								
43		Sales Unit Growth			5.0%	5.0%	5.0%	5.0%	5.0%	2.0%
44		Sales Price Growth			5.0%	5.0%	5.0%	5.0%	5.0%	2.0%
45		Cost Unit Growth			6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
46		SGA (% of revenue)			14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
47		Op Ex (% of revenue)			6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
48		Non-Op Ex (% of revenue)			1.8%	1.8%	1.8%	1.8%	1.8%	1.8%

FIGURE 3.14 This is a partial example of the possible scenarios, which are stored on the Vectors sheet below the live scenario section.

5. We should put assumptions in for the income statement items of the possible scenarios. While the user will ultimately define these numbers based on separate analyses, you should copy the figures in from the complete model on the CD-ROM. The base case section of the Vectors sheet on your model should look like Figure 3.14.
6. Before we can complete the live scenario section on the Vectors sheet, we need to add functionality so the user can switch between scenarios on the Assumptions sheet. Go to the Assumptions sheet and enter the following labels in the corresponding cells:

   B30: **Scenario Controls**
   B31: **Global Scenario Selector**

7. Still on the Assumptions sheet in cell D31, create a data validation list using the lst_Scenarios named range. Name cell D31 **inputs_ScenSelector** and select "Base Case" from the list as the starting value. This section should look like Figure 3.15.

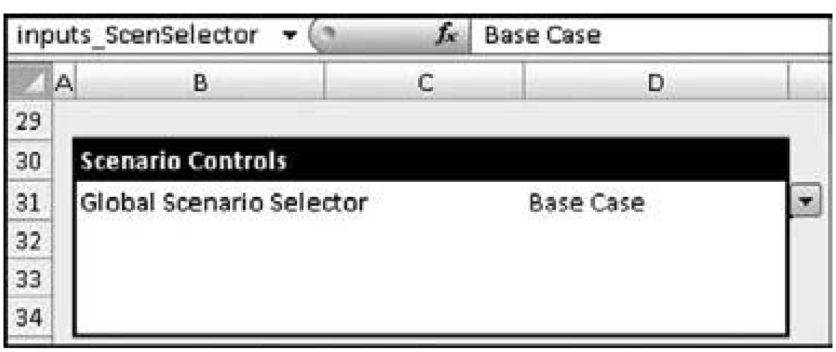


FIGURE 3.15 The user can select scenarios from the Assumptions sheet using a data validation list.

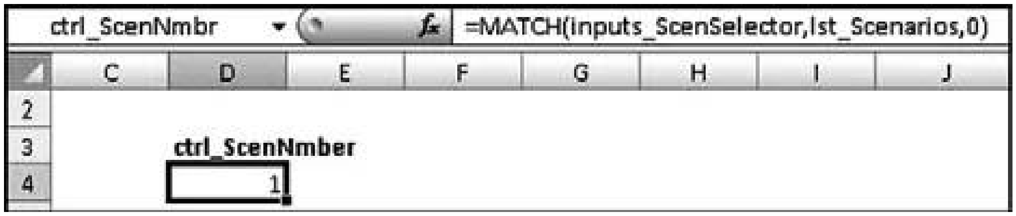


FIGURE 3.16 The text matching is converted to numbers for use in other functions.

8. Next, when most of our model is complete and we are running sensitivities, we may want to adjust the growth rate by a factor for incremental analysis. For this reason, we will create a global growth adjustor that increases or decreases the growth rate by a user-defined percentage. In cell F22, enter the text **DCF Valuation Assumptions**, and in cell I26, enter the text **Global Growth Adjustor**. Also name cell K26 **inputs_GlobalGrowth**. We will wait until Chapter 10 to finish this section since a special tool will be implemented to adjust growth.
9. We need to create one final reference cell on the Hidden sheet. This cell will convert the user-selected scenario from a name to a number. Go to the Hidden sheet and label cell D3 **ctrl_ScenNmber**. Enter the following formula in cell D4:

   =MATCH(inputs_ScenSelector,lst_Scenarios,0)

   Name cell D4 **ctrl_ScenNmbr**. The MATCH function provides the ordinal number for the scenario that the user selected from the list of possible scenarios. This addition should look like Figure 3.16.
10. We can now jump back to the Vectors page and enter the following formula in cell E12:

    =CHOOSE(ctrl_ScenNmbr,E43,E74,E105,E136)*(1+inputs_GlobalGrowth)

    Copy this formula over the range E12:J13. The CHOOSE function takes the numeric representation of the scenario and uses it to pull data from the possible scenario data below. For instance, if scenario 1, otherwise known as the "Base Case," is selected, the MATCH function earlier makes the ctrl_ScenNmbr cell a 1, which the CHOOSE function uses as its index number to pull the first set of data. For example, cell E12 will take the data from cell E43. The result from the CHOOSE function is then adjusted by the global growth adjustor created on the Assumptions page. If using the CHOOSE function is new or unclear to you, refer to the Toolbox at the end of this chapter.

    As the global growth adjustor pertains only to revenue growth, the other income statement items should not include it. In cell E14, enter the following formula:

    =CHOOSE(ctrl_ScenNmbr,E45,E76,E107,E138)

Copy this formula over the range E13:J17. The scenario selector is mainly complete. The user can switch between scenario names on the Assumptions sheet and have the live/current scenario figures change. Soon we will start connecting calculations to the live/current scenario figures. Keep in mind that we will revisit this section in Chapter 11, when we implement additional scenario functionality using VBA.

BRINGING REVENUES AND COSTS TOGETHER: THE INCOME STATEMENT

Understanding the earnings of a company by just analyzing a firm's revenues and costs independently can be challenging. The most common method of organizing revenues and costs is to create an income statement, which is the foundation of the three main financial statements. The income statement, or *profit-and-loss* (P&L) statement as some countries call it, is a report of a company's revenues and costs within a certain timeframe. For an annual statement this time frame is typically a *fiscal* year. As mentioned in Chapter 2, be careful of the fiscal year for a company since it may not line up like a calendar year, where the time period starts in January and ends in December.

Regardless of the fiscal year, most income statements follow a standard pattern, as seen in Figure 3.17. The income statement gives a complete picture of a company's earnings. Items beyond operating revenues and costs, such as interest, depreciation, amortization, taxes, and retained earnings, appear on the income statement. These non-operating items are heavily influenced by the assets, liabilities, and equity of the firm, which is captured by the balance sheet. The balance sheet, the second of the three main financial statements, will be introduced in Chapter 4.

The income statement and the balance sheet are tightly linked and have many dynamic features that we will slowly introduce. In fact, a properly constructed discounted cash flow model will have sheets that represent the income statement and balance sheet with direct reference links between the two. These links will create functionality and maintain the principles of accounting; both the functionality and accounting behind it will be thoroughly discussed as we progress.

MODEL BUILDER 3.3: INTEGRATING THE INCOME STATEMENT

1. Insert a worksheet after the Vectors sheet and name it **Income Statement**.
2. On the Income Statement sheet, enter the text **Income Statement** in cell A1. Also, we will want to retain the timing from the Vectors sheet, so reference the dates and timing cells by entering references to the Vectors sheet. As an example, the

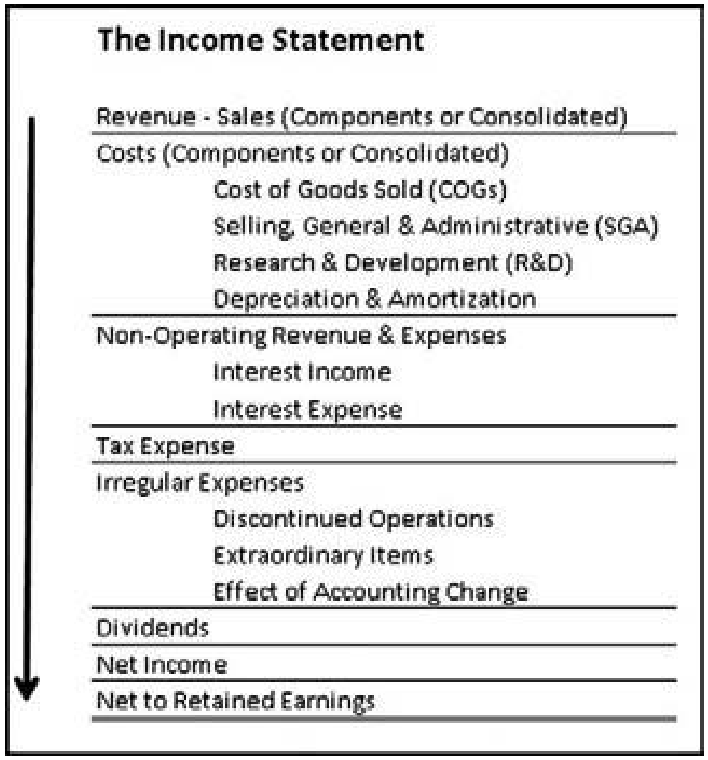


FIGURE 3.17 The income statement is the first of the three financial statements that will help us understand the valuation of a company.

first three cells of this section on the Income Statement sheet should have the following values in the corresponding cells:

D2: **=Vectors!D9**
E2: **=Vectors!E9**
F2: **=Vectors!F9**

This referencing pattern should continue for range G2:Z2. Also, complete a similar referencing pattern for row 3. The first three cells of this section are shown below:

D3: **=Vectors!D10**
E3: **=Vectors!E10**
F3: **=Vectors!F10**

Continue this referencing pattern for range G3:Z3. Refer to Figure 3.18 to make sure you are completing this step correctly.

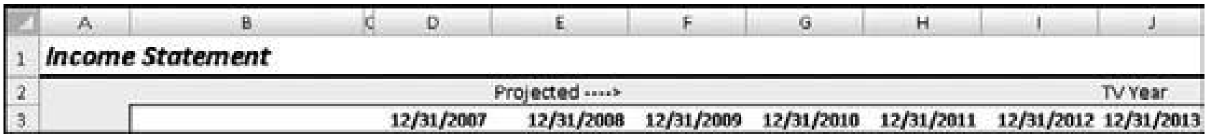


FIGURE 3.18 The top of the Income Statement sheet is a direct reference to the Vectors sheet.

3. The uppermost concept on the income statement is revenue or sales. Enter the following text in the corresponding cells:

   B5: **Sales Units**
   B6: **Sales Price**
   B7: **Sales Revenue**

4. We will assume we have last period's actual data and will enter it in cells D5 and D6. To tie in with the example model, enter the values **100** in cell D5 and **2.00** in cell D6. When running analyses, these numbers should tie into realized, audited figures from the last period.
5. The values just entered in cells D5 and D6 should be grown over the projection periods by the growth rates from the Vectors sheet. Enter the following formulas in the corresponding cells:

   E5: **=D5*(1+Vectors!E12)**
   E6: **=D6*(1+Vectors!E13)**

   Copy and paste these formulas over to column J within their respective rows.
6. Enter the following formula in cell D7:

   =D5*D6

   Copy and paste this formula over range D7:J7. This row represents the amounts of revenue from sales that we would expect to receive over the forecast period.
7. The next two rows on the income statement are where the cost of goods sold is calculated. Enter the text **Cost Units** in cell B8. We will assume the last period's actual data is a value of .5. This should be entered in cell D8. The cost unit is how much each unit cost and is grown by a rate on the Vectors sheet. Enter the following formula in cell E8:

   =D8*(1+Vectors!E14)

   Copy and paste this formula over the range E8:J8.
8. The next row is the actual cost of goods sold. Enter the text **Cost of goods sold** in cell B9. Enter a value of **70** in cell D9 as a historic assumption. As we will

	A	B	C	D	E	F	G	H	I	J
1	***Income Statement***									
2					Projected ----->					TV Year
3				**12/31/2007**	**12/31/2008**	**12/31/2009**	**12/31/2010**	**12/31/2011**	**12/31/2012**	**12/31/2013**
4										
5		Sales Units		100.00	105.00	110.25	115.76	121.55	127.63	130.18
6		Sales Price		2.00	2.10	2.21	2.32	2.43	2.55	2.60
7		Sales Revenue		200.00	220.50	243.10	268.02	295.49	325.78	338.94
8		Cost Units		0.50	0.53	0.56	0.60	0.63	0.67	0.71
9		Cost of Goods Sold		70.00						
10		**Gross Profit**		130.00						

FIGURE 3.19 The top of the income statement starts with revenue and cost of goods sold to get the gross margin. Note that this will not be complete until we finish the balance sheet.

link the cost of goods sold to our inventory assumption, we cannot complete this section until Chapter 4. In general, though, the cost of goods sold represents the dollar amount of cost to produce the sales revenue.

9. The difference between sales revenue and cost of goods sold is gross profit. Prepare for the gross profit calculation by entering the text **Gross Profit** in cell B10. Enter the following formula in cell D10:

   =D7-D9

   Copy and paste this formula over the range D10:J10. Thus far, the Income Statement sheet should look like Figure 3.19.
10. After the gross profit, there are more operating expenses to a company, such as selling, general, and administrative costs (SG&A). SG&A can be further broken down into components of sales and non-sales or kept consolidated as in the example model. Salary, rent, administrative costs, advertising costs, and so on are normally captured in the SGA cost line. Enter the text **SG&A expense** in cell B11. Assume the historical period's amount is 27 by entering that value in D11. Here SG&A was calculated as a percentage of revenue. To be consistent with that calculation, enter the following formula in cell E11:

    =E7*Vectors!E15

    Copy and paste this formula over the range E11:J11.
11. Other operating expenses might also need to be included. For this reason, enter the text **Operating expenses** in cell B12. Enter the value **9.30** for the historical period in cell D12. Then enter the following formula in cell E12:

    =E7*Vectors!E16

    Copy and paste this formula over the range E12:J12.

12. In cell B13, we will calculate the earnings before interest, taxes, depreciation and amortization (EBITDA). Enter the text **EBITDA** in cell B30. Enter the following formula in D13:

    =D10-D11-D12

    Copy and paste this formula over the range D13:J13.
13. If you are following along with the complete model on the CD-ROM, you will notice that the next two lines in the income statement are for depreciation and amortization. These are items we will go into more detail with after the balance sheet is introduced and fill in on the income statement later. For now, let's set up some of the functionality for when we return to those topics by entering the text **EBIT** in cell B17. Enter the following formula in cell D17:

    =D13-D15-D16

    Copy and paste this formula over the range D17:J17. For those unaccustomed to the semantics, *EBIT* stands for *earnings before interest and taxes* (basically EBITDA, less the depreciation and amortization).
14. After the core earnings are determined, there occasionally can be non-operating expenses such as damaged goods, insurance costs, and so on. To incorporate this concept, enter the text **Non-operating expenses** in cell B19. Enter the value **2** in cell D19 for the historical year and then enter the following formula in cell E19:

    =E7*Vectors!E17

    This formula should be copied and pasted over the range E19:J19.
15. Similar to depreciation and amortization, we are going to skip over the interest income and expense section of the income statement. These amounts will be generated once we work through the balance sheet and then connected to the income statement. Skip down to cell B33 and enter the text **EBT**. This will be where we calculate the EBIT net of interest expense. Enter the following formula in cell D33:

    =D17-D19+D25-D32

    Copy and paste this formula over the range D33:J33. Note that even though we skipped over concepts, we inserted the addition and subtraction for the future items in this formula. As we complete the income statement in later chapters, this formula will make more sense.
16. We have now added all taxable income and netted tax-shielding expenses. The amount that is left, the earnings before tax (EBT), is what is taxed. We need to set up the Vectors sheet with our tax assumption. As this possibly could be part of scenarios, we will enter the hard-coded percentages under scenario names and

FIGURE 3.20 The tax rate figures are stored under each scenario and can be adjusted depending on the scenario selected.

reference them using the CHOOSE function in the live/current scenario section. To do this, go to the Vectors sheet and enter the label **Tax Rate** in cell B31 and then set cells B62, B93, and B124 equal to cell B31.

17. For all of the scenarios each period, assume the tax rate is 30%. This value should be entered in each cell in the following ranges:

    E62:J62
    E93:J93
    E124:J124

    Figure 3.20 shows the new addition to the base case section of the Vectors sheet.
18. Enter the following formula in cell E31 on the Vectors sheet:

    =CHOOSE(ctrl_ScenNmbr,E62,E93,E124,E155)

    Copy and paste this formula over the range E31:J31.
19. With the Vectors sheet done for this section, go back to the Income Statement sheet. Enter the text **Tax Provision** in cell B35. Enter the following formula in cell D35:

    =D33*Vectors!E31

    Copy and paste this formula over the range D35:J35. This formula multiplies the EBT by the current period's tax rate to determine the tax liability.
20. The major item of the Income Statement, the net income, can now be calculated. Enter the text **Net Income** in cell B36 and then enter the following formula in cell D36:

    =D33-D35

    Copy and paste this formula over the range D36:J36.
21. Enter the text **Dividends** in cell B38. Assume historical dividends were **5** by entering the value in cell D38. We will assume a growing expectation of dividends. Enter the following values in the corresponding cells:

    E38: **5**
    F38: **5**
    G38: **10**

	A	B	C	D	E	F	G	H	I	J
33		**EBT**		85.20						
34										
35		Tax Provision		25.56						
36		**Net Income**		59.64						
37										
38		Dividends		5.00	5.00	5.00	10.00	10.00	10.00	10.00
39		**Net to Retained Earnings**		54.64						

FIGURE 3.21 The bottom of the income statement contains very important items, including the net income and the net to retained earnings.

H38: **10**
I38: **10**
J38: **10**

This is just a proxy value to get information into the income statement, but dividends would tend to be estimated based on performance, historical payouts, and shares outstanding. Keep in mind that dividends usually get locked out if the company is distressed. We will examine this idea later since we can build a switch to lock out dividends if necessary.

22. Enter the text **Net to Retained Earnings** in cell B39. Then enter the following formula in cell D39:

=D36-D38

Copy and paste this formula over the range D39:J39. Retained earnings are very important since they represent the equity put back into the firm. From a modeling perspective, this line is also very important since it will be directly referenced on the balance sheet. The bottom of the income statement should look like Figure 3.21.

A WORK IN PROGRESS

The income statement is not done yet, but we have made significant progress. Throughout future Model Builders we will add to the Assumptions, Vectors, and Income Statement sheets. Keep in mind that the model is being assembled in a conceptual fashion. We will complete concepts as much as possible until we run into sections where one concept is dependent on another concept. This is the case after finishing a majority of the income statement, which describes the general cash flow of the business. The dependent concept is the capital structure of the firm, which is captured by the balance sheet and the various items that make up assets, liabilities, and equity.

TOOLBOX

AVERAGE

The AVERAGE function is a very easy function to determine the arithmetic average of a set of numbers. The entry parameters are the numbers that are to be averaged:

AVERAGE(value 1, value 2, . . . value n)

The mathematical operation performed adds up all of the values of the numbers and divides by the count of items. For example, if we entered the following formula we would get an answer of 6:

=AVERAGE(3,5,10)

The answer returned starts with $3 + 5 + 10$, which is equal to 18. Divide 18 by the count of 3 numbers that were added together, and we get 6.

AVERAGEIF

AVERAGEIF is a useful function if there are conditions to the average that we are creating. The entry parameters require three different pieces of information:

AVERAGEIF(range that contains a condition to be tested, the conditional test, possible values to average)

In this chapter, we used AVERAGEIF when explaining growth-rate methodologies. In Figure 3.22, we can see that range E7:E12 contains values of Y and N. These are just text values depending on the user's preference and entry, and would be the first entry parameter for the AVERAGEIF function. The second entry parameter is a conditional test. In this example we want to average values only if there is a Y in the range E7:E12. The conditional test that should be entered is just the letter we are looking for: "Y." Make sure to use double quotes around the Y; otherwise, Excel will think you are trying to reference a named range or a different function. The last entry parameter is the range of values that can possibly be included in the average (range D7:D12).

Here are three important points to keep in mind when using AVERAGEIF:

1. The range that contains the condition to be tested must have the exact same number of items as the range that contains the possible values to average.
2. Conditional tests done with text must be bounded by double quotes on each side.
3. If you want to use more than one conditional test, there is an AVERAGEIFS function that accepts multiple conditions.

	A	B	C	D	E
1	**Growth Rates**				
2	The following exercise will examine three different me are four sections, but two of the sections are based on t				
3					
4		1) Arithmetic Average			
5		Year	Revenue	Growth Rate	Include
6		2002	150		
7		2003	178	18.67%	N
8		2004	210	17.98%	N
9		2005	247	17.62%	N
10		2006	275	11.34%	Y
11		2007	295	7.27%	Y
12		2008	310	5.08%	Y
13		Arithmetic Avg:		12.99%	7.90%

FIGURE 3.22 The AVERAGEIF function allows users to define conditional tests so only certain values are captured in the arithmetic average.

PRODUCT

The PRODUCT function is a mathematical function that returns the product of values that are entered as an array. The PRODUCT function's entry parameters include:

PRODUCT(value 1, value 2, value n)

For instance, if **=PRODUCT(1,3,2)** were entered, the cell value would be 6 (1 * 3 * 2).

GEOMEAN

Rather than calculating the geometric mean by hand, the GEOMEAN function calculates it for us. The entry parameters for the GEOMEAN function include:

GEOMEAN(value 1, value 2, value n)

The official formula for GEOMEAN is (value 1 * value 2 * value n)^(1/n). In this example, n stands for the eventual number of values to be averaged.

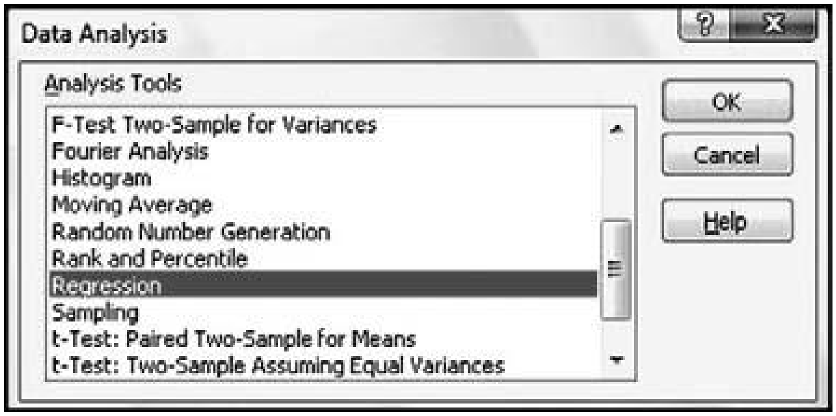


FIGURE 3.23 There are a number of data analysis tools to quickly perform complex analyses on data sets.

Data Analysis—Regression

Excel 2003 and 2007 provide powerful data analysis tools. Many can be recreated using math or prebuilt functions, but Excel's data analysis tools often provide the most complete flexibility and results. To access data analysis tools in Excel 2003, go to the Tools menu and select **Data Analysis**. For Excel 2007, go to the Data menu and select the Data Analysis button from the Analysis grouping. If you did not install the Analysis Tool Pak Add-In, the Data Analysis selections will not appear.

Regardless of your Excel version, after you select data analysis you will be presented with the Data Analysis dialogue box seen in Figure 3.23.

As part of this example we will select the Regression option from the list of possible data analysis techniques. This brings up the Regression data analysis dialogue box as shown in Figure 3.24.

For example purposes we will use a data set with an obvious relationship: the price of oil and Nigerian GDP from the years 2000 to 2005. In this example we assume that Nigerian GDP is dependent on the price of oil. To establish this relationship and understand how we could forecast Nigerian GDP based on the price of oil, we will use Excel's regression tool. Once we have the Regression dialogue box open, we need to determine the dependent variable and the independent variable(s). As we learned from step 12 of Model Builder 3.1, the known *y*'s are the dependent variable data points. The known *x*'s are the independent variables. The regression tool changes the terminology slightly and asks for the "Input Y-Range" for the dependent variable and the "Input X-Range" for the independent variable. Figure 3.25 shows the Regression dialogue box with the entry parameters for the dependent and independent variables.

A very important nuance is the "Labels" box, which in the example is checked. This means that the variable data's first row contains a label and not data. Notice that the range references in the dialogue box encapsulate the labels on the worksheet

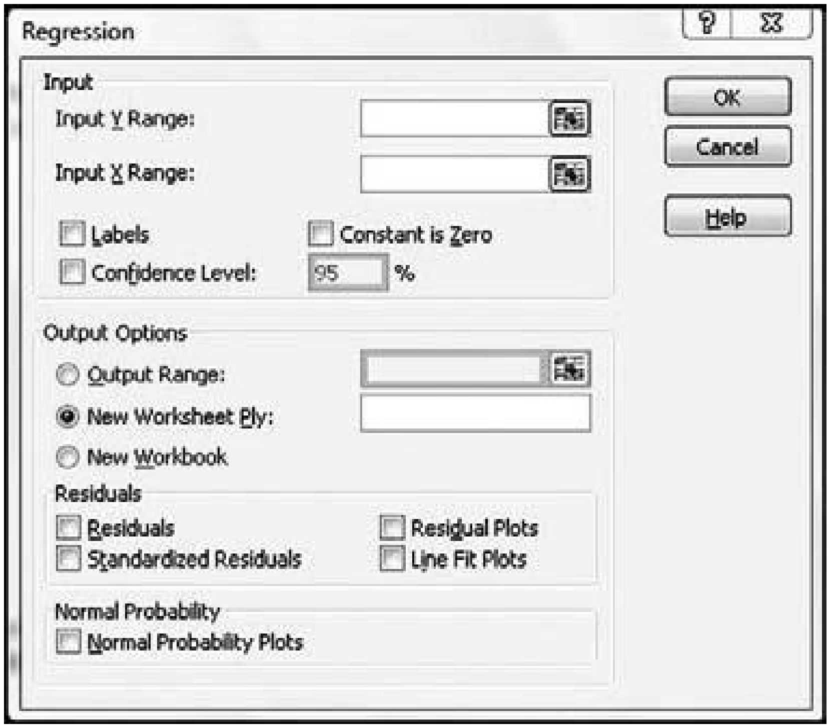


FIGURE 3.24 Regression parameters are entered into a dialogue box to give us the most flexibility with our analysis.

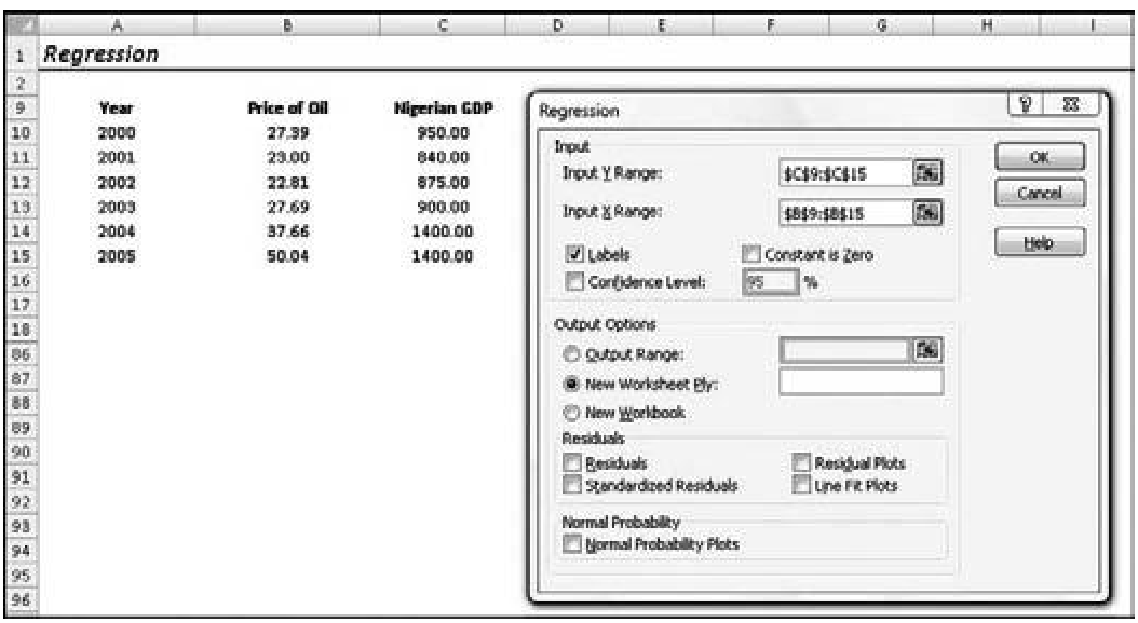


FIGURE 3.25 Entry parameters using the dependent and independent variable data are loaded into the Regression dialogue box.

(both cell B9 and cell C9 are labels, which are referenced in the dialogue box). If we referenced those cells without checking the labels box we would get an error. Even worse, if we merely referenced data cells and left the Labels box checked we would miss data since Excel would think the first row was a label. It is recommended to use labels since the regression outputs are difficult enough to interpret on their own and even harder without labels!

Also notice in Figure 3.25 that there is a section in the Regression dialogue box called "Output Options." In this area, we can choose to have the regression data output as a separate workbook, a worksheet within the current workbook, or on the sheet where the data is contained. The regression output takes 18 rows' and 9 columns' worth of cell space, so if it is kept on the sheet there should be plenty of room. Otherwise, the output could overwrite existing data. In our example, we will export the data to cell E9 on the current worksheet. There is a particularly annoying issue when selecting "Output Range:" as we do in this example. When the option button is selected, the dependent data is automatically highlighted. If a user immediately selects cell E9, the dependent data entry parameter will be overridden to reference cell E9. After selecting the Output Range: option button, make sure to click in the associated field in the dialogue box to avoid this problem. Once the output option is selected, we are ready to run the regression by pressing **OK**. There are many other options for the regression, but we will demonstrate the minimum inputs necessary to get the regression data.

If you have been following along, the output should look similar to Figure 3.26. This figure also highlights the more important sections of the output using bold borders.

	E	F	G	H	I	J	K	L	M	N
9		SUMMARY OUTPUT								
10										
11		*Regression Statistics*								
12		Multiple R	0.92							
13		R Square	0.85							
14		Adjusted R Square	0.81							
15		Standard Error	115.17							
16		Observations	6							
17										
18		ANOVA								
19			*df*	*SS*	*MS*	*F*	*Significance F*			
20		Regression	1	298460.87	298460.87	22.50	0.01			
21		Residual	4	53059.96	13264.99					
22		Total	5	351520.83						
23										
24			*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
25		Intercept	335.73	159.93	2.10	0.10	-108.31	779.78	-108.31	779.78
26		Price of Oil	23.07	4.86	4.74	0.0090	9.57	36.57	9.57	36.57

FIGURE 3.26 The Excel regression tool returns a robust set of results.

D10 f_x =$G$26*B10+$G$25

Year	Price of Oil	Nigerian GDP	Back Test
2000	27.39	950.00	967.60
2001	23.00	840.00	866.32
2002	22.81	875.00	861.94
2003	27.69	900.00	974.52
2004	37.66	1400.00	1204.52
2005	50.04	1400.00	1490.11

FIGURE 3.27 A back test of our regression output should yield figures that are close to our dependent variable.

The first part of the regression that we want to understand is the relationship between Nigerian GDP and the price of oil. Recall the scatter plot in Model Builder 3.1 and the formula for determining the trend line between the data points: $y = mx + b$. In this case our slope is m, which we can find in the Excel outputs as the Price of Oil Coefficient (23.07). Our intercept is b, which is appropriately labeled Intercept Coefficient (335.73). This means that our formula for the relationship between the Nigerian GDP and the price of oil is $y = 23.07x + 335.73$, with x being the price of oil and y being Nigerian GDP. How can we back-test this to make sure we are doing things correctly? Let's use this formula on the example's historical oil prices and see what Nigerian GDPs would be returned. Figure 3.27 shows the Excel formula referencing the regression output and the results of applying the regression formula.

The results of the back test are close to the historical values, but not exact. Inexact figures from the back test are normal since most regression analyses have error. The standard error of each variable and the regression are also returned by Excel, as seen in Figure 3.26. Standard errors give us an indication of the variation of each of the data sets and the regression as a whole. The main result to notice is that our P value is less than .05, which means our regression is significant. The other critical element is the R square. This tells us how strong of a relationship the two variables have. The R square will be a number between 0 and 1. The higher the R square, the more the variability witnessed by the dependent variable is explained by the independent variable. In our example, 85% of the variability in Nigerian GDP is caused by the variability in oil prices.

Here are three final points to keep in mind when using the regression tool in Excel:

1. Up to 16 independent variables can be loaded as the Input X-Range.
2. The P value is *not* the probability of the variable occurring.
3. The ANOVA information is typically useful only if you are testing more than three variables for explanatory purposes. Otherwise, in a two-variable situation the significance F and the P value for the correlation coefficient will be the same.

LINEST

Rather than have a full set of outputs returned, a shortcut to getting key regression information is using the LINEST function. LINEST stands for *line estimate* and generally returns information necessary for creating and assessing a trend line estimate for a least squares regression. The function accepts the following entry parameters:

LINEST(known y's, known x's, constant, statistics)

Just as before, the known *y*'s are the dependent variables, the known *x*'s are the independent variables, the constant is an optional entry if we have one for the line estimate, and the statistics entry is either a TRUE or FALSE. If the statistic entry is left blank or FALSE, the function will return only the slope and the intercept. If the statistic entry is set to TRUE, then the function returns the slope, intercept, standard error of the variables, standard error of the regression, the R square, the regression F statistic, the residual degrees of freedom, and the residual sum of squares.

Using LINEST is tricky though because it is set up to be used as an array function. An array function can return multiple values using the same formula. To get the LINEST function to work correctly and return the full set of statistics, we need to highlight a two-column-by-five-row area on the sheet. The correct amount of cells along with the previous Toolbox section's data set is depicted in Figure 3.28.

We can then enter the formula by typing in the function, referring to the dependent and independent variables in the correct order, skipping over the constant entry, but remembering to type TRUE for the statistics entry. The complete formula should look like:

=LINEST(C4:C9,B4:B9,,TRUE)

Finally, instead of just pressing **ENTER**, we need to hold down **CTRL** and **SHFT** and then press **ENTER**. This tells Excel that we are entering an array formula. If CTRL-SHFT is not held down while pressing ENTER, then only the upper-leftmost cell, from the cells that were highlighted, will be populated with the first return value: the slope.

E3 {=LINEST(C4:C9,B4:B9,,TRUE)}

LINEST

Year	Price of Oil	Nigerian GDP
2000	27.39	950.00
2001	23.00	840.00
2002	22.81	875.00
2003	27.69	900.00
2004	37.66	1400.00
2005	50.04	1400.00

23.0691	335.7331
4.863404	159.9328
0.849056	115.1737
22.49989	4
298460.9	53059.96

FIGURE 3.28 The LINEST function can return the main statistics we need from a least squares regression. This must be done in a very specific manner since LINEST is meant to be used as an array function.

Individual Regression Functions (SLOPE, INTERCEPT, RSQ, STEYX)

Sometimes even the LINEST function returns too much information. In the case of our growth rates, we are often concerned with only a few specific statistics. Namely, we would like to know the slope and perhaps a few other measures of confidence in our figures. For many of the important regression statistics there are individual functions that can be used. Each one accepts the same entry parameters:

"Any regression based function"(known y's, known x's)

The following important functions work in the same way and are depicted in Figure 3.29:

SLOPE returns the slope of the regression.
INTERCEPT returns the intercept of the regression.
RSQ returns the R square of the regression.
STEYX returns the standard error of the regression.

FORECAST

A function that often goes overlooked but is actually very powerful is the FORECAST function. This function runs a full least squares regression on historical data, takes a new independent sample, and then provides the forecasted dependent data. The entry parameters for the FORECAST function are as follows:

FORECAST(new independent data, known y's, known x's)

	A	B	C	D	E	F
1	**Individual Regression Functions**					
2						
3	**Year**	**Price of Oil**	**Nigerian GDP**			
4	2000	27.39	950.00		SLOPE	23.0691
5	2001	23.00	840.00		INTERCEPT	335.7331
6	2002	22.81	875.00		RSQ	0.85
7	2003	27.69	900.00		STEYX	115.1737
8	2004	37.66	1400.00			
9	2005	50.04	1400.00			

FIGURE 3.29 Individual functions can be used to return regression results.

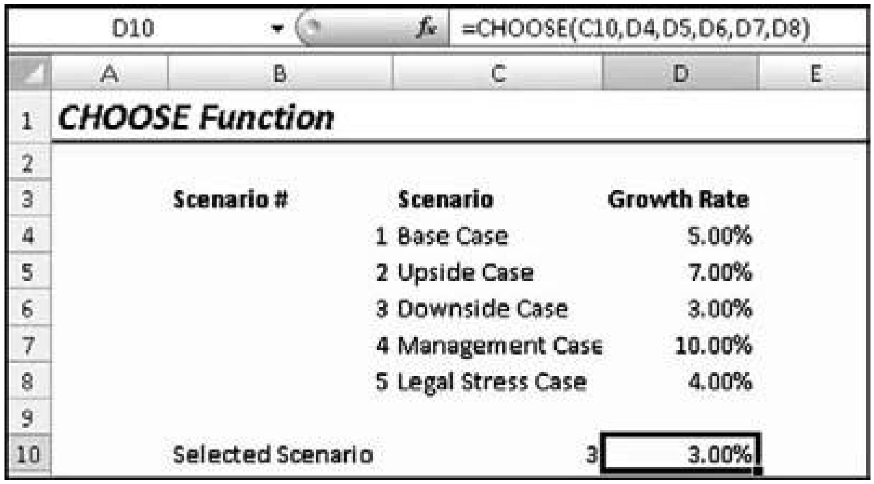
For example, we can demonstrate the FORECAST function and prove its calculations using the oil/Nigerian GDP example. In Figure 3.30, an estimate of Nigerian GDP is provided given a $100 price of oil. This is done in two ways: the first using the slope and intercept of the data and then using the equation $y = mx + b$, and the second using the FORECAST function.

Essentially, the FORECAST function returns the estimated dependent value given a new independent data point and a set of historical data that defines the relationship between the two variables.

E11 f_x =FORECAST(D11,E4:E9,D4:D9)

	A	B	C	D	E	F	G	H
1	**FORECAST Function**							
2								
3			**Year**	**Price of Oil**	**Nigerian GDP**		**Slope**	23.0691
4			2000	27.39	950.00		**Intercept**	335.7331
5			2001	23.00	840.00			
6			2002	22.81	875.00			
7			2003	27.69	900.00			
8			2004	37.66	1400.00			
9			2005	50.04	1400.00			
10	Using Formula		Test Price	100.00	2642.64			
11	Using FORECAST		Test Price	100.00	2642.64			

FIGURE 3.30 The FORECAST function runs a least squares regression and provides dependent data estimates based on new independent data.



D10 =CHOOSE(C10,D4,D5,D6,D7,D8)

	A	B	C	D	E
1	**CHOOSE Function**				
2					
3		**Scenario #**	**Scenario**	**Growth Rate**	
4			1 Base Case	5.00%	
5			2 Upside Case	7.00%	
6			3 Downside Case	3.00%	
7			4 Management Case	10.00%	
8			5 Legal Stress Case	4.00%	
9					
10		Selected Scenario	3	3.00%	

FIGURE 3.31 The CHOOSE function is frequently used to manage scenarios.

CHOOSE

The CHOOSE function is often used in corporate valuation models for scenario selection. The entry parameters for the CHOOSE function are as follows:

CHOOSE(index number, choice 1, choice 2, choice 3 . . .)

The way this function works is the user enters or references what is known as the *index number*. This number is the selection from the upcoming choices that will be returned. For instance, if the index number is a 2, then choice 2 will be returned. Figure 3.31 depicts this functionality with an index number of 3 and the third value of five possible values being returned.

Keep in mind that we could further automate this example by using a data validation list so the user selects a scenario, then using a MATCH function to return the scenario number, and then referencing or integrating the MATCH return into the CHOOSE function. This functionality also can be seen in the Toolbox Ch.3.xls file.

Here are some important points to keep in mind when using the CHOOSE function:

- The values must be entered one at a time. You cannot reference a range of possible values such as CHOOSE(1,D15:D19). This would have to be entered:

  CHOOSE(1,D15,D16,D17,D18,D19)

- Alternative scenario systems can be implemented using a reference combination such as OFFSET MATCH. These systems are faster to implement, but are problematic if there are different numbers of rows for scenarios or the data is not in a continuous range.

4

Capital Structure and Balance Sheet

Even with strong revenue, a firm can experience financial stress and possible bankruptcy if its assets, liabilities, and capital structure are poorly selected or structured. Management has the ability to select or partially control nearly all items that relate to the sources and uses of funds in the firm. On the asset side, the more obvious items are large capital expenditure projects such as building a new warehouse; a more obscure one could be directing in-store advertising toward more cash versus credit sales. As for the liabilities and capital structure, management is responsible for determining how to fund assets. They have the ability to select different types of debt and equity or work with other entities to structure financing to fit the company's needs. All of the financing comes at a cost, which revenue must be able to cover in the long term.

Companies can have innumerable variations of assets, liabilities, and capital structure. There is an expansive spectrum of combinations. On the extremes, a manufacturing firm may have multiple warehouses and machinery and be financed mostly with equity, while a financial services company may have assets consisting of complex financial instruments and equally complex financial products making up its capital structure. To make sense of all of these possibilities, accountants created a financial statement known as the *balance sheet*. This financial statement is an organized account of what the company owns, what the company owes, and how much of the company is owned. It is broken down into standard categories, typically organized from the most liquid items to least liquid.

Each of the items that compose a firm fits into one of the standard categories of the balance sheet, as shown in Figure 4.1. The most critical concept that accountants built into the creation of the balance sheet is the *balance principle*: Assets must always equal liabilities plus equity. Simply put, nothing is free. Whenever an asset is created, funds are used to do so. If there is an imbalance between assets and liabilities plus equity, it means something is unaccounted for and the analyst's view of the company is incomplete.

An unbalanced balance sheet should never occur in past audited financial statements. This is because historical balance sheets reflect a specific moment or snapshot in time. In corporate valuation modeling, we are making predictions about the future, which could create instances of an unbalanced balance sheet. For example, we may assume the company will build a particular plant that is primarily funded

ASSETS	**LIABILITIES**
Cash and near cash	Accounts payable
Marketable securities	ST borrowings
Accounts receivable	Other current liabilities
Inventories	
Other current assets	
Current assets	**Current liabilities**
Gross fixed assets	LT borrowings
Accumulated depreciation	**Total liabilities**
Net fixed assets	
	EQUITY
Intangibles	Minority interest
Amortization	Total common equity
Net intangibles	Retained earnings
	Total equity
LT investments & receivables	
Total assets	**Total liabilities & equity**

FIGURE 4.1 Although each company's balance sheet could have a variety of items, most are grouped in standard categories in descending order of liquidity.

by a long-term debt issuance. Multiple assumptions that vary across possible stress scenarios can easily throw off the balance of assets, liabilities, and equity. One example would be an expected decrease in the cost of the building the plant. Holding all other variables constant, we would have a situation where we issued more funds from the loan than necessary. This causes the balance principle to be violated by having liabilities and equity greater than assets. Our model needs to account for and repair any imbalance. We will see that in corporate valuation modeling we will always maintain the cardinal rule of assets equaling liabilities plus equity, but rather than wasting time balancing the balance sheet each period, we will set up our model in such a way that it does so automatically. Figure 4.2 is a graphic of this cardinal rule.

To accomplish our goal of thoroughly understanding the balance sheet and implementing it in a model, we will dedicate two additional chapters beyond this one. Since the balance sheet describes the entire underpinnings of a company, there are sections that we will want to analyze in as much detail as possible. Although this could vary among companies, the most common sections that require in-depth analysis are capital expenditures, depreciation, amortization, and long-term debt. This chapter will provide an overview and framework for the balance sheet; Chapters 5

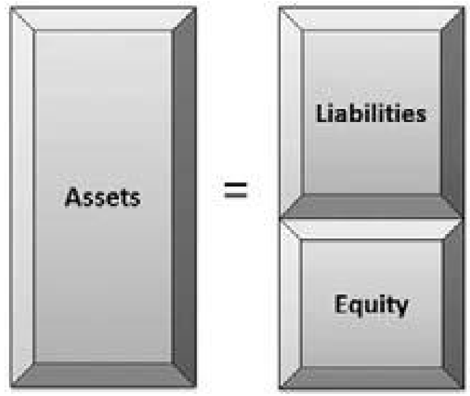


FIGURE 4.2 Assets must always equal liabilities plus equity. Historically, this is easy to see, but in a projection model we must automate the balancing process.

and 6 examine the aforementioned sections in detail. As with all chapters, we will begin with theory and concept discussion, move on to Model Builder instructions, and wrap up with a Toolbox.

WHAT THE COMPANY OWNS

An asset is an item that the company owns. The more tangible items include warehouses, plants, machinery, and equipment. Financial instruments such as cash, receivables, and securities are also classified as assets. Regardless of the type of asset, the focus of analysis for assets is understanding their value. Some assets are easy to value, such as cash or highly liquid securities, while others are problematic, such as illiquid securities or defaulting receivables. To get a better understanding of the nuances involved in analyzing assets, we will go through the primary asset categories, their descriptions, and valuation issues.

Cash and Highly Liquid Securities

One of the most seemingly straightforward but often misunderstood concepts is cash. I typically distinguish between three types of cash in a valuation:

1. *Cash:* the minimum amount necessary to operate the company
2. *Surplus cash:* any cash projected that is above and beyond the minimum amount necessary to operate the company
3. *Marketable securities:* securities that are highly liquid

Be careful when distinguishing between these three. The first item, cash, is the cash necessary for the company to operate. For most nonfinancial institutions this should not be an extraordinary number. Cash projected can be valued at its face value. Rare exceptions include businesses in emerging market countries with highly devaluing currency. These businesses may keep large reserves of foreign currency or may have entered into currency swaps, which will show up on a different part of the balance sheet. Also keep in mind that cash typically earns a small amount of interest, which can be integrated into a valuation model each period.

Surplus cash is merely a concept for projection models. This is technically the "plug" on the asset side. When a model's liabilities plus equity are greater than the assets, the remaining cash can be thought of as surplus. Think about what would cause liabilities and equity to become greater than the assets. A tangible example would be a capital expenditure that actually costs less than what was funded through debt. If the capital expenditure cost $98 million and $100 million of long-term debt was issued, there is $2 million of surplus cash. We will work with this concept in detail when we must set up an automatic balancing of the model.

The third and final cash item is marketable securities. These could be investments in money market accounts, certificates of deposit, or guaranteed investment contracts (GICs). They are typically very secure, short-term investments that are valued at their face amount. Figure 4.3 depicts the three cash items and when they occur.

Accounts Receivable

When an order is shipped or a sale is made in a store, a receivable is generated. That receivable either can be paid instantly with a form of cash or it can be paid over time. Usually businesses try to keep accounts receivable to as short a duration as possible and will offer deals such as *2% 10 net thirty*, meaning that if the customer

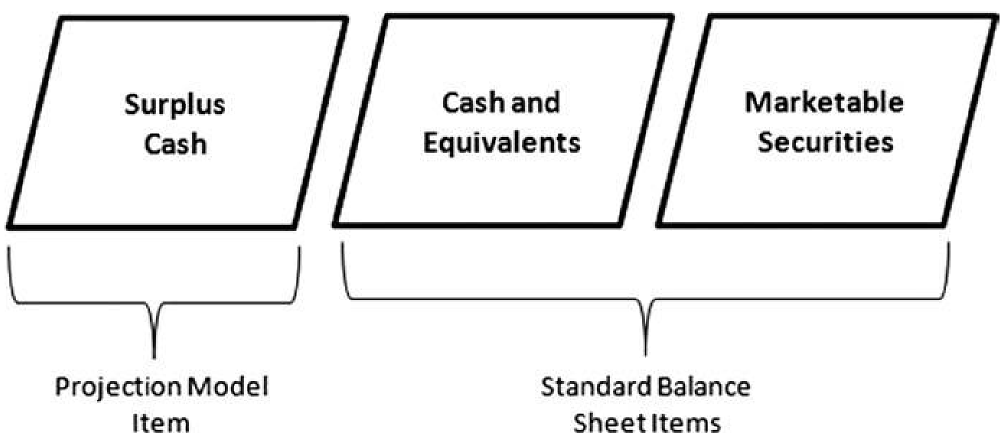


FIGURE 4.3 Surplus cash is found only in projection models, while cash and marketable securities are standard balance sheet items.

pays within 10 days of goods delivery, then a 2% discount will be applied to the receivable; otherwise, the receivable is due in 30 days.

Other forms of discounts can include product-placement discounts or discounts eventually passed on to customers, for which the firm is ultimately responsible. These discounts should be noted in the company's financial statements. For corporate valuation modeling it's important that the figures used to project accounts receivable include these discounts; otherwise, the accounts receivable value could be overstated.

Another valuation problem with accounts receivable relates to doubtful accounts or a bad loan reserve. Holders of accounts receivable are subject to an obligor's ability and propensity to pay. When accounts receivable become very delinquent, there is an eventual expectation that they will not pay. For companies with small-to-medium accounts receivable a bad loan reserve percentage based on historical bad loans can be applied to decrease the accounts receivable figure. If accounts receivable is a core component of the business operation, then more sophisticated techniques may be appropriate. For example, a valuation that I completed involved an appliance and electronics retailer that sold three-fourths of its products on credit. These sales were booked as accounts receivable. The consumers who purchased these products were of average-to-poor credit quality, with default rates in the upper teens. Defaults followed specific timing patterns typical of consumer credit portfolios. Given the size of the credit sales as a percent of the total revenue and the high default rates, a detailed delinquency and default analysis was integrated into the valuation model.

Inventories

Finished products ready for sale and materials that are ready to be made into products are accounted for as inventory. Three categories usually comprise inventory:

1. *Raw materials:* unprocessed materials
2. *Work in process (WIP):* products in production (i.e., between a raw material and a finished good).
3. *Finished goods:* complete, ready-to-sell products

The major valuation challenge with inventories is timing, which is captured by two different accounting methods. The first method is *first-in-first-out* (FIFO), which is the only method of inventory accounting that IFRS allows. When an item is sold, its value moves from the inventory account on the balance sheet to the cost of goods section of the income statement. Under FIFO, the amount by which that inventory account should be reduced is based on the cost of making the oldest of the same product in inventory.

Under the *last-in-first-out* (LIFO) method, the last product made in inventory represents the value that is removed from the inventory account. Often a company is constantly producing and selling products, allowing LIFO-based inventory valuation to use only the latest product costs for their products. Critics of LIFO contend that the method allows lower inventory valuation and higher cost of goods sold than in actuality. For this reason, IFRS does not allow LIFO-based valuation. In order to compare the results of two valuation models, their inventory valuation methodologies must be the same.

Other Current Assets

Any other item that is liquid within the next 12 months is considered a current asset. Typical other current assets are prepaid expenses, which are items or services that have been paid for but not yet received. These can include:

- Vendor deposits
- Salary advances
- Prepaid rent
- Insurance premiums

Property, Plant and Equipment (PP&E)

The most tangible items within a company are often categorized under property, plant, and equipment. Land, warehouses, production plants, and equipment items of varying sizes are grouped into this category. Specific examples depend on the type of company that is under consideration. For example, an airline company would have multiple planes, repair equipment, warehouses, and hangars under this category. Alternatively, an energy company would primarily list its property and energy plants.

A key point to keep in mind is that PP&E is listed at book value. This is typically thought of as *gross PP&E*. Plant and equipment lose value over time due to wear and tear, otherwise known as *depreciation*. This depreciation is accumulated over time and netted out of gross PP&E to arrive at *net PP&E*. Until an asset is disposed of, its book value is listed under gross PP&E and its accumulated depreciation is netted out. Net PP&E is counted toward the value of the assets.

Notice in the previous paragraph that *land* was not included as an item that loses value over time. Under IFRS, land is not depreciated as part of PP&E.

Intangibles

If PP&E categorizes the tangible assets of the firm, *intangibles* categorizes the intangible assets of a company. What is an *intangible*? Items such as patents, copyrights, trademarks, licenses, other forms of intellectual property rights, and goodwill are examples of intangible assets. Essentially, they are items with value that do not have a tangible form.

Intangibles are challenging to value since they often can be unique; however, they are treated similarly to PP&E in that they can lose value over time. Patents expire, technology can be replaced, and overall intangible value erodes over time. For these reasons, intangible values are amortized over a specific useful life, similar to depreciation. Gross intangibles are kept on the balance sheet along with accumulated intangible amortization. Net intangibles are counted toward the value of the assets.

Goodwill is an exception for intangibles. IFRS 3 and SFAS 142 ended the amortization of goodwill. It is, however, periodically reviewed for impairment.

Other Long-Term Assets and Receivables

Oftentimes a company has some type of long-term investment, such as bond or note investment. This section of companies' balance sheets has come under quite a bit of scrutiny since the advent of the mortgage-backed security (MBS) credit crisis that originated in 2007. Purchasers of MBSs and other structured finance securities typically list these assets on the balance sheets in this section. Overall, two general methods of valuing long-term assets are to use market values or to create an intrinsic valuation based on expected cash flow. Intrinsic valuation can be very challenging given the complexity of some of these assets; however, systems and consulting companies exist that are able to process very detailed valuations of such assets.

MODEL BUILDER 4.1: STARTING THE BALANCE SHEET WITH ASSETS

1. Insert a worksheet after the Income Statement sheet and name it **Balance Sheet**.
2. In cell A1, enter the text **Balance Sheet**.
3. Similar to the other sheets, we will create the balance sheet as a projection and require the dates that we are projecting. As an example, the first three cells of this section on the Balance Sheet sheet should have the following values in the corresponding cells:

   D2: **=Vectors!D9**
   E2: **=Vectors!E9**
   F2: **=Vectors!F9**

   This referencing pattern should continue for range G2:Z2. Also, complete a similar referencing pattern for row 3. The first three cells of this section are shown below:

   D3: **=Vectors!D10**
   E3: **=Vectors!E10**
   F3: **=Vectors!F10**

   Continue this referencing pattern for range G3:Z3. Refer to Figure 4.4 to make sure you are completing this step correctly.

	A	B	C	D	E	F	G	H	I	J
1	***Balance Sheet***									
2					Projected ---->					TV Year
3				12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013

FIGURE 4.4 The dates and timing are continued on the Balance Sheet sheet.

4. We will start at the top of the balance sheet with assets, specifically current assets. Enter the text **Assets** in cell B5 as a label. Then enter the following text in the corresponding cells to get the labels down for current assets:

   B6: **Surplus Funds**
   B7: **Minimum Cash**
   B8: **Marketable Securities**
   B9: **Accounts Receivable**
   B10: **Inventory (units)**
   B11: **Inventory Unit Purchases**
   B12: **Inventory Dollar Purchases**
   B13: **Inventory (dollars)**
   B14: **Other Current Assets**
   B15: **Current Assets**

5. With the labels complete, we should now insert one year of historical information. Enter the following values in the corresponding cell references:

   D7: **10**
   D8: **4**
   D9: **17**
   D10: **5**
   D11: **0**
   D12: **0**
   D13: **10**
   D14: **1**

   Also enter the formula **=SUM(D6:D9,D13:D14)** in cell D15. This will total the historic current assets. Copy and paste that formula over the range D15:J15. Thus far the Balance Sheet sheet should look like Figure 4.5.
6. We go back to the Vectors sheet and create the assumptions for the balance sheet. These assumptions will have been based on historical or expected performance. Studies similar to what we did for revenue should be done to understand expected performance. Also, for this model many of the assumptions are based on revenue, which may or may not be the case in other analyses. Also, while we will try to automate the model so that accounting standards are followed, make sure that

	A	B	C	D
1		***Balance Sheet***		
2				
3				**12/31/2007**
4				
5		**Assets**		
6		Surplus Funds		
7		Cash and Near Cash		**10.0**
8		Marketable Securities		**4.0**
9		Accounts Receivable		**17.0**
10		*Inventory (units)*		***5.0***
11		*Inventory Unit Purchases*		***0.0***
12		*Inventory Dollar Purchases*		***0.0***
13		Inventory (dollars)		**10.0**
14		Other Current Assets		**1.0**
15		Current Assets		42.0

FIGURE 4.5 The current assets in the balance sheet start to take form.

the assumptions entered make accounting sense. Let's start this by going to the Vectors sheet and entering the following text in the corresponding cells:

B19: **Balance Sheet Items**
B20: **Minimum Cash (% of Revenue)**
B21: **MS (% of Revenue)**
B22: **AR (% of Revenue)**
B23: **Inventory (% of Revenue)**
B24: **Other CA (% of Revenue)**
B25: **Other LTA (% of Revenue)**
B26: **AP (% of Inventory Purchases)**
B27: **Other CL (% of Revenue)**
B28: **Other LTL (% of Revenue)**
B29: **Other Equity (% of Revenue)**

7. As with the income statement section of the Vectors sheet, we need to set up the possible scenarios with the labels created in the previous step. Enter the following formulas in the corresponding cells:

B50, B81, B112: **=B19**
B51, B82, B113: **=B20**
B52, B83, B114: **=B21**
B53, B84, B115: **=B22**
B54, B85, B116: **=B23**
B55, B86, B117: **=B24**
B56, B87, B118: **=B25**

	A	B	C	D	E	F	G	H	I	J
50		**Balance Sheet Items**								
51		Cash (% of revenue)			5.0%	1.0%	1.0%	1.0%	1.0%	1.0%
52		MS (% revenue)			2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
53		AR (% of revenue)			8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
54		Inventory (% of sales units)			10%	10%	10%	10%	10%	10%
55		Other CA (% of revenue)			1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
56		Other LTA (% of revenue)			10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
57		AP (% of inventory purchases)			30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
58		Other CL (% of revenue)			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
59		Other LTL (% of revenue)			5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
60		Other Equity (% of revenue)			1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

FIGURE 4.6 Proxy values for the Vectors sheet should be entered in order to generate values as we construct the model.

B57, B88, B119: **=B26**
B58, B89, B120: **=B27**
B59, B90, B121: **=B28**
B60, B91, B122: **=B29**

8. We should also put proxy numbers in for the values each period, for each scenario. Given the large number of hard-coded numbers to enter for each scenario, refer to the complete model on the CD-ROM. Figures from the balance sheet section of each scenario in the Vectors sheet can be copied and pasted directly into the model you are building. Figure 4.6 shows an example of what the base case section should look like for the balance sheet items.
9. Just as was completed for the income statement items on the Vectors sheet, we must implement formulas in the live scenario section so that the correct values are referenced in the model, depending on the scenario the user has selected. Enter the following formula in cell E20:

   =CHOOSE(ctrl_ScenNmbr,E51,E82,E113,E144)

   Copy and paste this formula over the range E20:J29.
10. Back on the Balance Sheet sheet, we now create formulas to project out the balance sheet items based on the Vector assumptions just entered and the projected revenue from the income statement. Enter the following formulas in the corresponding cells:

    E7: **='Income Statement'!E5*Vectors!E19**
    E8: **='Income Statement'!E5*Vectors!E20**
    E9: **='Income Statement'!E5*Vectors!E21**

    Copy and paste these formulas across to column J. For instance, cell E7 should be copied and pasted over the range E7:J7, cell E8 should be copied and pasted over the range E8:J8, and so on.

11. Rows 10 through 13 are dedicated to calculating inventory. The first formula to enter is in cell E10:

    ='Income Statement'!E5*Vectors!E23

    This quantifies the number of units to expect in inventory based on sold units. Next, we have to realize that we made an assumption about how many units we sold and should consider that in order to achieve those sales we need to produce the units. Therefore, we look at how many units are expected to be sold, plus how many extra were kept in inventory. This logic is expressed in the formula that should be entered in cell E11:

    ='Income Statement'!E5+'Balance Sheet'!E10-'Balance Sheet'!D10

    We can then convert the units purchased to a dollar amount based on the cost of each unit. Do this by entering the following formula in cell E12:

    =E11*'Income Statement'!E8

    We can also value our inventory based on its cost value. Enter the following formula in cell E13:

    =E10*'Income Statement'!E8

    Copy and paste all of the formulas from this step over to column J while maintaining their respective rows.
12. Now that we know our inventory, we can jump back to the income statement to complete the cost of goods sold calculation. Go to the Income Statement sheet and enter the following formula in cell E9:

    ='Balance Sheet'!D13-'Balance Sheet'!E13+'Balance Sheet'!E12

    Notice that this formula looks at the difference between last year's inventory and the current period's inventory and adds that amount to the purchased inventory. Think about the values currently in the example model. Inventory declines from 10 to 5.57 from 12/31/2007 to 12/31/2008, suggesting that $4.43 worth of inventory was sold. However, in order to justify the sales figures that we are posting, we must have purchased goods that were sold. We did, and this is captured in cell E12. Copy and paste cell E9 over the range E9:J9.
13. Go back to the Balance Sheet sheet and enter the following formula in cell E14:

    ='Income Statement'!E7*Vectors!E24

    Copy and paste the formula over the range E14:J14. Thus far the current assets section of the Balance Sheet sheet should look like Figure 4.7.

	A	B	C	D	E	F	G	H	I	J
5		**Assets**								
6		Surplus Funds			0.00	62.92	136.68	236.71	350.50	470.92
7		Cash and Near Cash		**10.0**	11.03	2.43	2.68	2.95	3.26	3.39
8		Marketable Securities		**4.0**	4.41	4.86	5.36	5.91	6.52	6.78
9		Accounts Receivable		**17.0**	17.64	19.45	21.44	23.64	26.06	27.12
10		*Inventory (units)*		***5.0***	10.50	11.03	11.58	12.16	12.76	13.02
11		*Inventory Unit Purchases*		***0.0***	110.50	110.78	116.31	122.13	128.24	130.44
12		*Inventory Dollar Purchases*		***0.0***	58.57	62.23	69.27	77.09	85.80	92.51
13		Inventory (dollars)		**10.0**	5.57	6.19	6.89	7.67	8.54	9.23
14		Other Current Assets		**1.0**	2.21	2.43	2.68	2.95	3.26	3.39
15		Current Assets		42.0	40.8	98.3	175.7	279.8	398.1	520.8

FIGURE 4.7 The balance sheet current assets should start taking form. Note that items in italics are not assets, but calculations to help establish asset values.

14. For now we are going to skip over implementing PP&E and intangibles since Chapter 5 will be dedicated to those concepts. This brings us to our expectation for other long-term assets and receivables. As we do not know of any management plans to acquire or dispose of these assets, we will assume they will maintain a historical level commensurate to their revenue. Earlier, in cell B24 on the Vectors sheet, we created the label **Other LTA**, which stands for *Other Long-Term Assets*. The percentages we entered in row 25 are our percent of revenue expectations for other long-term assets and receivables. To implement this projection, enter the following text, value, and formula into the corresponding cells on the Balance Sheet sheet:

    B25: **LT investments & receivables**
    D25: **8.04**
    E25: **='Income Statement'!E7*Vectors!E25**

    Copy the formula in E25 and paste it over the range E25:J25.
15. We will wrap up the asset side of this Model Builder by summing the total assets. Enter the label **Total Assets** in cell B26 of the Balance Sheet sheet. Enter the following formula in cell D26:

    =D15+D19+D23+D25

    Copy and paste this formula over the range D26:J26. Refer to Figure 4.8 for a view of how the model should look thus far.

WHAT THE COMPANY OWES

If assets can be thought of as what the company owns, liabilities are what the company owes. Every item that the company owns is either owned and paid for by people who have an interest in the company (equity) or was paid for by a creditor (liability). Similar to assets, liabilities are organized by current liabilities, which are

	A	B	C	D	E	F	G	H	I	J
5		**Assets**								
6		Surplus Funds			0.00	62.92	136.68	236.71	350.50	470.92
7		Cash and Near Cash		**10.0**	11.03	2.43	2.68	2.95	3.26	3.39
8		Marketable Securities		**4.0**	4.41	4.86	5.36	5.91	6.52	6.78
9		Accounts Receivable		**17.0**	17.64	19.45	21.44	23.64	26.06	27.12
10		*Inventory (units)*		***5.0***	10.50	11.03	11.58	12.16	12.76	13.02
11		*Inventory Unit Purchases*		***0.0***	110.50	110.78	116.31	122.13	128.24	130.44
12		*Inventory Dollar Purchases*		***0.0***	58.57	62.23	69.27	77.09	85.80	92.51
13		Inventory (dollars)		**10.0**	5.57	6.19	6.89	7.67	8.54	9.23
14		Other Current Assets		**1.0**	2.21	2.43	2.68	2.95	3.26	3.39
15		Current Assets		42.0	40.8	98.3	175.7	279.8	398.1	520.8
16										
17										
18										
19										
20										
21										
22										
23										
24										
25		LT Investments and Receivables		**8.0**	22.05	24.31	26.80	29.55	32.58	33.89
26		**Total Assets**		**138.04**	**270.90**	**313.27**	**381.38**	**460.29**	**559.51**	**677.92**

FIGURE 4.8 The asset side of the Balance Sheet sheet takes form. Note that we will complete the PP&E and intangibles section in Chapter 5, and that some values in this figure will not appear in a model being built according to the Model Builder steps.

due within 12 months, and long-term liabilities, which are due over a period greater than 12 months.

Accounts Payable

When goods and services are purchased but not immediately paid for, a payable is generated. For the company, this is a debt they owe, although it typically does not bear interest. There are few valuation issues with accounts payable. One possibility is that the amounts reflected include a discount for early payment and the early payment does not actually take place. This would underestimate accounts payable by a small percent.

The other issue for accounts payable is that when a company becomes distressed it might try to finance its business through accounts payable, essentially taking goods and services on credit and not paying for them, nor paying an interest expense. A detrimental strategy such as this should be clear to ratings analysts, who will probably downgrade the company, making it more costly and difficult for the company to borrow. This is a red flag as it perpetuates the distress cycle and could lead to the downfall of a company.

Short-Term Borrowings, Credit Facilities, and Revolvers

A company typically tries to match its assets and liabilities so that there is little discrepancy between revenue generation and funding. Unfortunately, projections can be imprecise and there are times when small amounts of funding (relative to long-term debt) may be necessary to keep operations flowing smoothly. These amounts are considered short term in nature as they are loans that are expected to be repaid within a year or sooner. Short-term debt can be a direct loan from a bank or a drawdown from an established credit facility or revolving account.

The difference between a direct loan and a credit facility is cost and time. A direct loan may be slightly less expensive to implement, but can take longer depending on approval. This can also cause problems during distressed times as approval can be denied. Usually companies set up credit facilities, where there is a preapproved amount of credit that can be drawn down. The trade-off is cost. A credit facility will charge an undrawn amount on the credit line and then an increased amount on drawn balances. For financial modeling purposes, we would have to track both of these charges.

More importantly, for financial modeling, short-term debt often serves as the liability and equity side plug when the projection model creates more assets than liabilities and equity. Some may wonder how a situation could occur where more assets than liabilities and equity are created. A simple way to conceive of this is to imagine running a stress scenario where capital expenditures are expected to exceed base-case forecasting—a situation that occurs frequently. Usually, a set amount of long-term debt is structured for capital expenditures. In a stress situation where capital expenditures are higher than expected, gross PP&E increases. The funding of this increase on the balance sheet must come from somewhere, with short-term debt being the most likely candidate.

Current Portion of Debt

Principal and interest on debt, both long and short term, that is due within the next 12 months is considered the *current portion* of debt. This is classified under current liabilities. On a complete balance sheet, the current portion of debt is a very important figure. There needs to be enough liquidity in the company or earnings potential to service the debt. In particular, cash is required to service the immediate debt payments. If this cannot be done, the firm risks defaulting on its debt and possibly being forced into bankruptcy and, ultimately, liquidation by debt holders.

One needs to be very careful when using a projection model and determining the payment ability of a firm. For instance, we could look at cash on hand in a given period and compare it to the current portion of debt, but relying on cash may not be sustainable. Perhaps the company sold off an asset in a particular period that generated cash. Unless the debt is ultimately paid off, selling off assets is an *unsustainable* method of paying down debt. We may want to look at other sources of funds for debt payment, particularly earnings before interest, taxes, depreciation and amortization (EBITDA). This cash would be available for us to pay down interest. After taxes, dividends, and capital expenditures, we can then use the remaining cash to pay down principal. In Chapter 6, we will look at debt-repayment capacity in much more detail.

Ultimately, we are building a financial projection model for analysis. In the core model, the Balance Sheet sheet will not include the current portion of debt since we will actually try to pay debt over the course of each period. We will still be able to see repayment capacity once the debt sheet is created in Chapter 6.

Other Current Liabilities

As with current assets, there are usually smaller or unique items to a company that do not quite fit in other categories. A common example is salaries payable, which is money that is due to employees but not yet paid. More specific current liabilities exist depending on industry. For instance, in the airplane industry there is often a line item for air traffic liability. These are amounts paid for by passengers and cargo clients, but prior to the service date of the travel or shipment.

Long-Term Borrowings

A company can fund itself in two ways: with money that the owners of the company already have (equity), or by borrowing money from others (debt). When a company seeks debt financing, it can either ask creditors for a corporate loan directly or seek funding from the capital markets via a bond issuance. Overall, debt financing has its advantages and disadvantages compared to equity, which we will examine in detail in Chapter 6.

For now, we should realize that long-term debt shows up on the balance sheet and is considered a liability. Repayment of that liability is a major concern for both the company and the lender. Since many focus a great deal of time on debt, the example model will have an entire sheet, called the *Debt sheet*, dedicated to determining the debt schedule, the repayment capacity, and the tracking of ongoing balances. The long-term borrowings section of the Balance Sheet sheet will reference the balances from the Debt sheet to obtain the correct balances of the long-term borrowings at any given time.

MODEL BUILDER 4.2: CONTINUING THE BALANCE SHEET WITH LIABILITIES

1. Go to the Balance Sheet sheet and enter the following labels in the corresponding cells:

   B29: **Liabilities**
   B30: **Accounts Payable**
   B31: **ST Borrowings**
   B32: **Other Current Liabilities**
   B33: **Current Liabilities**

2. For now, we will establish proxy numbers for the current liabilities on the balance sheet. Enter the following values in the corresponding cells:

   D30: **15**
   D31: **0**
   D32: **3**

3. In cell D33, enter the following formula:

   =SUM(D30:D32)

   Copy and paste this formula over the range D33:J33.
4. In steps 6 to 8 of Model Builder 4.1, we entered the necessary assumptions on the Vectors sheet for a few of the liabilities on the Balance Sheet sheet. We will now put those to use with the following formulas:

   E30: **= E12*Vectors!E26**
   E32: **='Income Statement'!E7*Vectors!E27**

   Copy and paste these formulas from the E column to the J column. For instance, cell E30 should be copied and pasted over the range E30:J30. See the example model or Figure 4.9 if this is unclear. Also, keep in mind that we purposely skipped row 31 as this is the short-term debt row, which will be the liability and equity side plug to balance the balance sheet. We will come back to this in Chapter 7, when we finish off the balance sheet.
5. Move down the Balance Sheet sheet and enter the label **LT Borrowings** in B35. Also enter a value of **0** in cell D35. We will not fill in any projection formulas at this time since we will examine long-term debt in much more detail in Chapter 6.
6. We will finish off this Model Builder section by entering the text **Total Liabilities** in cell B36. Also enter the following formula in cell D36:

   =D33+D35

   Copy and paste this formula over the range D36 through J36. The Balance Sheet sheet should look like Figure 4.10 at this point.

	A	B	C	D	E	F	G	H	I	J
29		**Liabilities**								
30		Accounts Payable		15.00	17.57	18.67	20.78	23.13	25.74	27.75
31		ST Borrowings								
32		Other Current Liabilities		3.00	6.62	7.29	8.04	8.86	9.77	10.17
33		Current Liabilities		18.00	44.10	26.0	28.8	32.0	35.5	37.9

FIGURE 4.9 The current liabilities section of the Balance Sheet sheet.

	A	B	C	D	E	F	G	H	I	J
29		**Liabilities**								
30		Accounts Payable		15.00	17.57	18.67	20.78	23.13	25.74	27.75
31		ST Borrowings								
32		Other Current Liabilities		3.00	6.62	7.29	8.04	8.86	9.77	10.17
33		Current Liabilities		18.00	44.10	26.0	28.8	32.0	35.5	37.9
34										
35		LT Borrowings								
36		Total Liabilities		18.00	79.10	52.8	47.5	42.5	39.5	37.9

FIGURE 4.10 The liabilities section of the Balance Sheet sheet. Note this figure shows values that will not appear yet on a model that is following the Model Builder steps. The values will populate upon completion.

WHAT THE COMPANY HAS ALREADY PAID FOR

The final section of the balance sheet accounts for amounts owed to the equity holders. While debt holders are part of the firm's value, they hold a lien against the firm and are limited in earnings (and loss). Equity holders invest amounts with greater risk, but have a greater upside than debt holders. Overall, equity holders' returns are dictated directly by the performance of the company, whether they receive their return in the form of dividends or capital gains.

The most standard equity item is common stock, which is listed at issuance price. Common stock is the lowest denomination of equity and represents a fractional share in the market value of the equity in the company. Notice that it is not a fractional share in the market value of the company since debt must be netted out to understand equity value. Debt holders have priority over cash flow and therefore should be removed from the equity holder value. For instance, if the firm were being liquidated, the debt holders would be paid first and then funds would be dispersed to equity holders. Since debt holder amounts are taken away from equity holders, those amounts do not create shareholder value.

Other forms of equity include preferred stock, convertible preferred stock, and minority interest. Preferred stock is technically listed as equity, but it has many attributes of a liability. As with a liability, it typically has a fixed dividend payment based on a percentage, it can sometimes be called debt, and it can sometimes be structured so it converts to common shares. However, it is equity since it is listed as equity and has priority below debt and can sometimes be structured with a capital gains sharing mechanism (although it should never enjoy the full capital gains benefit that common shares receive).

Another type of equity is minority interest. This can often be a complex section of a balance sheet. Minority interest is determined by the percentage of interest one party has in another party. Typically, when one party has 20% or less interest in another company there is a minority interest.

If this sounds confusing, the best way to think about minority interest is to look at the situation where only two companies exist and one has a 20% interest in the other company, while the other company has an 80% interest in the first company. Let's denote Company A as having the minority 20% interest in Company B and Company B as having an 80% interest in Company A. This situation could have been created by Company B acquiring an 80% interest in Company A, thereby causing a consolidated approach according to IFRS. A consolidated accounting approach means that all of the assets from Company A are brought onto the balance sheet of Company B. As Company B does not own all of the assets, they must report a 20% minority interest in their liabilities and equity section of the balance sheet. Other forms of interest in other companies exist, which is dictated by IFRS based on ownership percentages.

The final form of equity that is extremely important is retained earnings. When a company earns money, as reported by the income statement, it eventually flows through as net income. The company then has the choice, depending on the Board of Directors' vote, to dividend that money out to equity holders, or to retain that money internally for use or distribution later. Any retained earnings from the past year are added to the current retained earnings to get the balance. Unless money is released as a dividend, funds are retained. Figure 4.11 shows the first of many connections between the income statement and the balance sheet.

Retained earnings are very important because they are the major link between the income statement and the balance sheet. From a financial modeling viewpoint, this link causes headaches because it is a source of circularity in the model that we must adjust for if we model the company with certain periodicities in mind. We will learn about this circularity more and see how this is efficiently calculated and automated in Chapter 7.

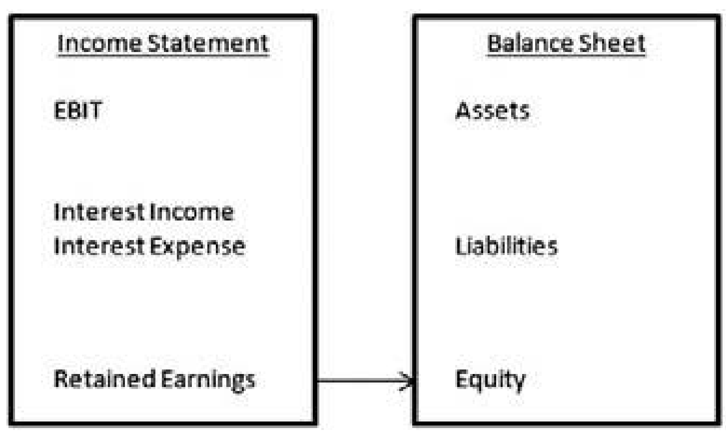


FIGURE 4.11 Retained earnings is a direct link from the Income Statement sheet to the equity section of the Balance Sheet sheet.

MODEL BUILDER 4.3: CONTINUING THE BALANCE SHEET WITH EQUITY

1. Still on the Balance Sheet sheet, label the equity section by entering the text **Equity** in cell B39.
2. Create the following labels in the associated cell references:

   B40: **Minority Interest**
   B41: **Total Common Equity**
   B42: **Retained Earnings**
   B43: **Total Shareholder Equity**

3. We should also enter historical values for 2007. Enter the following values in the corresponding cell references:

   D40: **0**
   D41: **100**
   D42: **20.04**

4. For Minority Interest and Common Equity, we will assume values for now. Enter the following values in each of the associated cells in the range:

   E37:J37: **0**
   E38:J38: **100**

5. Retained Earnings requires a formula that is connected to the Income Statement sheet. Enter the following formula in cell E42:

   ='Income Statement'!E39+D42

   Copy and paste this formula over the range E42:J42.
6. We should sum up the total shareholders' equity by entering the following formula in cell D43:

   =SUM(D39:D42)

   Copy and paste this formula over the range E43:J43.
7. The final part of this section is adding up the liabilities and equity. Enter the text **Total liabilities & equity** in cell B46. Enter the following formula in cell D46:

   =D36+D43

   Copy and paste this formula over the range D46:J46. The equity section of the Balance Sheet sheet should look like Figure 4.12.

	A	B	C	D	E	F	G	H	I	J
39		**Equity**								
40		Minority Interest		**0.00**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
41		Total Common Equity		**100.00**	**100.00**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
42		Retained Earnings		20.04	91.79	160.5	233.9	317.8	420.0	540.0
43		Total Shareholder Equity		120.04	191.79	260.47	333.89	417.80	519.99	640.00

FIGURE 4.12 The equity section of the Balance Sheet sheet. As with other figures, some values may populate later as the model develops.

TOOLBOX: BE CAREFUL WITH GROWTH

Although the actual Excel functions in this chapter's Model Builder exercises were neither new nor advanced, there are common errors that many novice financial modelers make. The first is to use a growth formula to project an item, when the item's assumptions are based on a *percentage* of revenue analysis. For instance, if cost of goods sold was historically analyzed and found on average to be 30% of revenue, then in a base case the projected period's revenue should be multiplied by 30% to estimate cost of goods sold. The common error is to implement a method similar to revenue growth by multiplying last year's cost of goods sold by (1 + .3).

Another error occurs when people try to back into a figure from a growth rate. For example, say one wanted to calculate last year's revenue given a growth rate of 10% and a current revenue estimation of 875. The common mistake is to multiply the 875 by .9. This is wrong as it will yield 787.50, which when grown by 10% equals 866.25. The proper method is to divide 875 by (1 + .1), which will yield 795.45.

5

Capital Expenditures, Depreciation, Intangibles, and Amortization

A number of items on the balance sheet are of critical importance to a company or have complex interactions with other concepts. In such instances it is best to create separate sheets for these concepts so details can be properly covered and implemented in Excel. *Capital expenditure* is one of these concepts. These are necessary investments a company makes in order to keep the business operational and to further expansion. As technology develops, more and more companies operate with fewer fixed assets than traditional capital expenditures purchase. Instead, their products are intangible items such as intellectual property, patents, and licenses. *Intangible* is another concept that we will want to understand and track in detail separately.

Regardless of whether money is invested in a fixed asset or an intangible, both items lose value over time. This complexity, known as *depreciation* for fixed assets and *amortization* for intangibles, necessitates rigorous technical methods to insure the concepts are properly implemented. Given that many businesses rely on fixed assets and/or intangibles to continue operations, we should look at each of these concepts carefully.

CAPITAL EXPENDITURES

As mentioned earlier, capital expenditures are investments in fixed assets that contribute to corporate operations. Typically, capital expenditures will be made to purchase property, plant, and equipment. Such purchases can be the entire focus of a model since capital expenditures can be significant outlays for a company. The best way to capture capital expenditure costs is by projecting future capital expenditures exactly as they are planned during the forecast period. To accomplish this, we will create detailed capital expenditure schedules that list the amount of capital expenditure on the date that it is expected to take place.

DEPRECIATION

Immediately after a capital expenditure takes place the asset begins to lose value due to normal wear and tear. This depreciation of the asset should be tracked with equal specificity as the original capital expenditure. To understand the depreciation of an asset, one needs to know the book value or cost, the useful life of the asset, and how much (if any) the asset is worth at the end of the useful life. Also, depending on the type of asset and the accounting regime the company follows, the depreciation calculation could be fairly complicated.

IFRS's standard accounting method of choice for calculating depreciation in a given period is known as *straight-line depreciation*. This simple method takes the cost of the asset, less the value at the end of the useful life, otherwise known as the *salvage value*, and divides that amount by the useful life of the asset. As a simple example, take a laptop computer used for a financial modeling training company. If the computer cost $2,000, had a useful life of three years, and was worth $500 at the end of the third year, the periodic depreciation would be $500 (($2,000 – $500)/3). Figure 5.1 depicts the straight-line formula.

Some argue that certain assets do not lose equal amounts of value over time, but rather lose more value in earlier years than later years. This concept is known as *accelerated depreciation* and is used by companies with assets that lose a lot of up-front value, such as vehicles. There are multiple methods of accelerated depreciation depending on how accelerated the depreciation is expected to be. The most basic type of accelerated depreciation is *fixed declining balance depreciation*, which can be accelerated by factors to increase the speed of the depreciation. See Figure 5.2 for the fixed declining balance depreciation formula. Less used types include sum of the year's digits and government depreciation systems such as modified accelerated cost recovery system.

Keep in mind that there are many more types of depreciation that exist. Some of these have been detailed in the Toolbox at the end of this chapter. Also there are some types of depreciation that are asset specific. For example, in project finance transactions one can encounter equipment that depreciates depending on use. Such forms of depreciation require the analyst to thoroughly investigate specific characteristics of the asset.

$$\text{Periodic Straight-Line Depreciation} = \frac{\text{Cost} - \text{Salvage Value}}{\text{Useful Life}}$$

FIGURE 5.1 The straight-line depreciation method equally spaces the depreciable amount of the asset.

$$\text{Periodic Fixed Declining Balance Depreciation} = (\text{Cost - Total Cumulative Depreciation}) * 1 - ((\text{Salvage Value/Cost})\text{^Useful Life}]$$

FIGURE 5.2 Fixed declining balance depreciation creates a rate based on the salvage value, cost, and usefulness and applies this to each period's remaining asset value.

A BALANCE SHEET OR AN INCOME STATEMENT ITEM?

The answer to the question of whether to classify capital expenditures and depreciation as a balance sheet item or an income statement item is *both*; the effects of capital expenditures and depreciation are found on both the balance sheet and the income statement. However, we must be very careful about the figures that show up on each. On the income statement, depreciation is first seen at the top, prior to EBIT. This is the depreciation for the current period. However, some income statements consolidate depreciation into operating expenses and the actual amounts must be found in footnotes.

Capital expenditures are not directly found on the income statement. However, effects of capital expenditures, such as the disposal of an asset originally created through capital expenditure, could show up on the income statement if there was a gain or loss on the eventual sale.

From a balance sheet perspective, capital expenditure adds to gross PP&E. As each capital expenditure takes place, the gross PP&E number grows. Only when assets are disposed of do their amounts get removed from the gross PP&E figure. However, gross PP&E is not used as part of the total assets calculation. Instead, we must net out all of the depreciation that accumulates for the assets. This means that each asset has periodic depreciation amounts, which are aggregated on the balance sheet under accumulated depreciation. Gross PP&E minus depreciation is equal to net PP&E, which is the value counted toward total assets. Refer to Figure 5.3 for more details on capital expenditures, intangibles, depreciation, and amortization on the income statement and balance sheet.

CONCEPT STATUS

Prior to implementing the first Model Builder that focuses on capital expenditures and depreciation, we should understand a common challenge that will begin to occur. Managing the current status of a concept and the effects of that status in a projection model is a difficulty that financial model builders face. For instance, capital expenditures are usually provided by amount and the expected date of the expenditure. Prior to that date there is no capital expenditure, on the capital

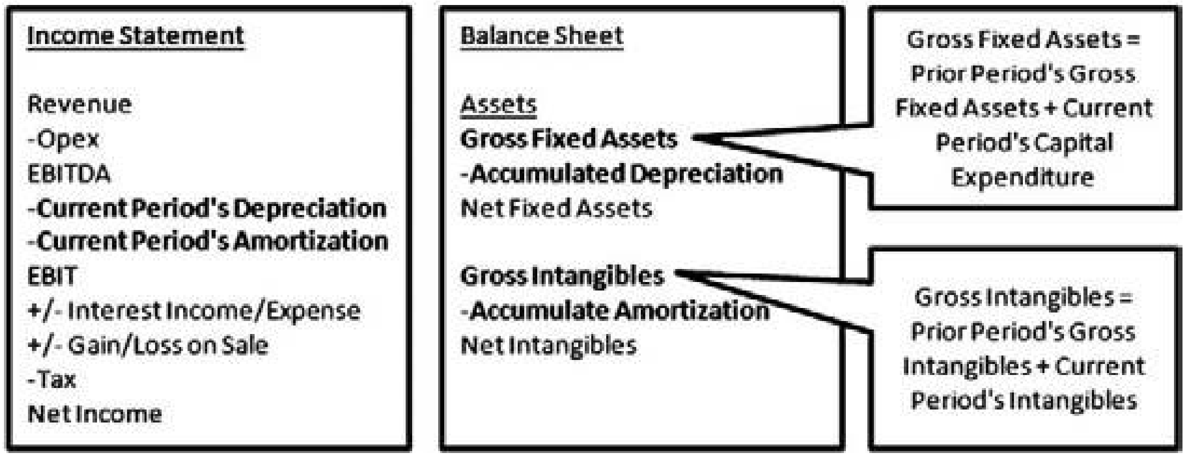


FIGURE 5.3 Capital expenditures, intangibles, depreciation, and amortization appear on both the income statement and balance sheet.

expenditure date there is the capital expenditure, and after that date depreciation begins. Further, depreciation will continue until the useful life of the asset is achieved or the asset is disposed of or impaired, or the accumulated depreciation of the asset is equal to the cost minus the salvage value. As we can see from these examples, both capital expenditures and depreciation have concept states that change over time. Our projection model must be flexible and implemented in such a way that it can adapt to changing characteristics of each concept. Figure 5.4 depicts the thoughts that should go into the concept status.

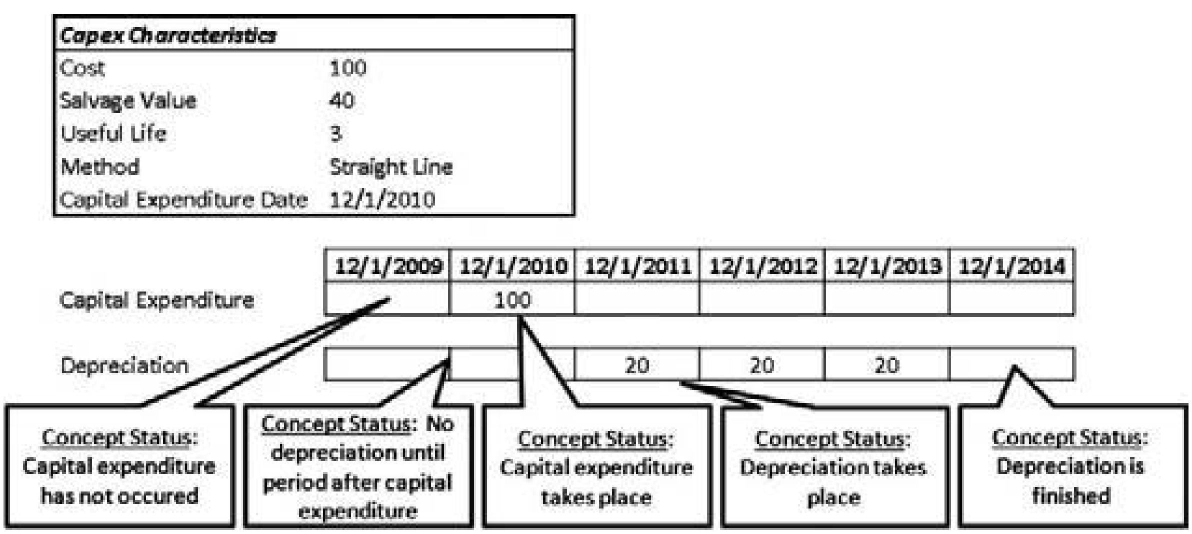


FIGURE 5.4 Many concepts in financial modeling change status over time.

MODEL BUILDER 5.1: CAPITAL EXPENDITURE SCHEDULES SETUP

1. Insert a sheet and name it **Capex**. There are many standard items to each sheet that we should create, such as the dates and timing and labels.
2. Enter the text **Capex** in cell A1. Then enter the following formulas in their corresponding cell references:

   D2: **=Vectors!D9**
   D3: **=Vectors!D10**

   Copy and paste these formulas over to column Z for both rows.
3. The assumptions for capital expenditures and depreciation will be controlled from the Assumptions sheet. We should jump to that sheet and set up assumptions so we can see the formulas work on the Capex sheet. Go to the Assumptions sheet and enter the following text in the corresponding cell references:

   B15: **Capex Assumptions**
   B17: **Capex 1**
   B18: **Capex 2**
   B19: **Capex 3**
   B20: **Capex 4**
   C16: **Depreciation Method**
   D16: **Amt**
   E16: **Capex Date**
   F16: **Useful Life (years)**
   G16: **Salvage Value**

4. We should put proxy values in to create a few capital expenditures that will make the building process easier to implement. Enter the following values in the associated cell references:

   D17: **85**
   D18: **25**
   D19: **10**
   D20: **0**
   E17: **12/31/2008**
   E18: **12/31/2008**
   E19: **12/31/2010**
   E20: **0**
   F17: **4**
   F18: **5**
   F19: **5**
   F20: **0**
   G17: **25**
   G18: **5**

	B	C	D	E	F	G
15	**CAPEX Assumptions**					
16		Depreciation Method	Amt	Capex Date	Useful Life (years)	Salvage Value
17	**Capex 1**	**Straight Line**	**85**	**12/31/2008**	**4**	**25**
18	**Capex 2**	**Straight Line**	**25**	**12/31/2008**	**5**	**5**
19	**Capex 3**	**Straight Line**	**10**	**12/31/2010**	**5**	**2**
20	**Capex 4**	**Straight Line**	**0**		**0**	**0**

FIGURE 5.5 The primary assumptions for the capital expenditures are stored and controlled on the Assumptions sheet.

G19: **2**
G20: **0**

Thus far the Assumptions sheet should look like Figure 5.5.

5. Now go back to the Capex sheet and enter the text **Capital Expenditure** in cell B4. Also enter the following cell references in the corresponding cells on the Capex sheet to create labels for the capital expenditure schedules:

   B5: **=Assumptions!B17**
   B6: **=Assumptions!B18**
   B7: **=Assumptions!B19**
   B8: **=Assumptions!B20**

6. We are now ready to enter the main capital expenditure schedule formula in cell E5:

   =IF(E$3=Assumptions!$E17,Assumptions!$D17,0)

   This single formula can be copied and pasted over the range E5:J8. Notice that this formula uses an IF function to test the current date of each column and compares that date against the possible capital expenditure dates. This is what is meant by *concept status*. Depending on the current period and the capital expenditure date, the status of the capital expenditure concept could be either an amount greater than zero or zero. If you are having trouble understanding the dollar signs in the formula, refer to this chapter's Toolbox for more details.

7. We should summarize the capital expenditures. Enter the text **Total Capex** in cell B10. Then enter the following formula in cell E10:

   =SUM(E5:E8)

   Copy and paste this formula over the range E10:J10. The Capex sheet should look like Figure 5.6.

	A	B	C	D	E	F	G	H	I	J
1	Capex									
2					Projected ---->					TV Year
3				12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
4		Capital Expenditure								
5		Capex 1			85.00	0.00	0.00	0.00	0.00	0.00
6		Capex 2			25.00	0.00	0.00	0.00	0.00	0.00
7		Capex 3			0.00	0.00	10.00	0.00	0.00	0.00
8		Capex 4			0.00	0.00	0.00	0.00	0.00	0.00

FIGURE 5.6 The upper part of the Capex sheet calculates the amount of capital expenditure on projection dates that the user assumes.

More on Capital Expenditure Schedules

We just implemented the capital expenditure schedule system, and some new financial modelers are asking the question: "What if we have multiple stages of capital expenditure for the same project?" For instance, what if the capital expenditure was a large plant that was to be created in multiple periods? In such cases, my preference is to create separate capital expenditure schedules for each phase. It is easier to work into the current formula and can be better if each phase has its own depreciation schedule.

As an example, take a two-stage project where a generator is built and then an assembly machine. Perhaps the generator is built first and used as soon as it is done to assist with the second capital expenditure. This would mean that the generator begins depreciating prior to the completion of the assembly machine. It would be ideal to separate out the capital expenditures so that the depreciation schedules can be easily distinguished. Otherwise, the two capital expenditures will have blended depreciation schedules, making the formula implementation complicated and the presentation difficult to dissect.

MODEL BUILDER 5.2: DEPRECIATION SCHEDULES SETUP

1. The depreciation schedules will be built directly underneath the capital expenditure schedules. On the Capex sheet, insert the text **Depreciation** in cell B12 and the cell references below to establish labels:

   B13: **=Assumptions!B17**
   B14: **=Assumptions!B18**
   B15: **=Assumptions!B19**
   B16: **=Assumptions!B20**

2. The example model gives the user the option of selecting one of two of the most common forms of depreciation: straight-line or fixed declining balance. To give the user a choice between these two, we will set up a data validation list on the Assumptions sheet. Prior to that we should create the list contents

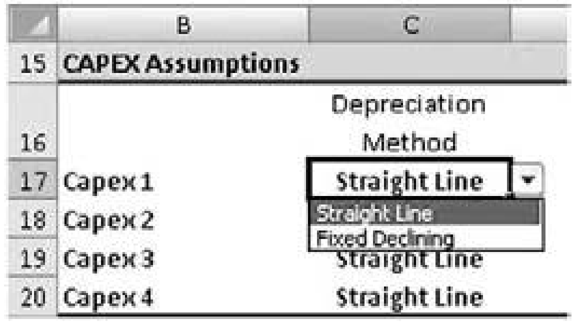


FIGURE 5.7 The user has the option to select different depreciation methods for each asset.

on the Hidden sheet. Go to the Hidden sheet and enter the following text in the corresponding cells:

A14: **lst_Depreciation**
A15: **Straight Line**
A16: **Fixed Declining**

Name the range A15:A16 **lst_Depreciation**.

3. Go to the Assumptions sheet and create data validations lists in range C17:C20 using the named range lst_Depreciation as the reference. The completed section is displayed in Figure 5.7.
4. The next formula, which determines the depreciation amount, is complicated. To tackle it we will work on it in sections. Prior to the actual formula instruction we should take a moment to think about the concept status. This is particularly important for depreciation. If we think about the different states for depreciation, we can break it down into three: (1) prior to any capital expenditure, there is no depreciation; (2) the period after a capital expenditure there is depreciation; and (3) once the asset is depreciated to its cost-minus-salvage value, then depreciation ceases. To handle the first part, we should implement the first part of the formula on the Capex sheet in cell E13 (note that the following formula is *not* complete):

   =IF(SUM($D5:D5)=0,0

   The first part of the formula is an IF function. It references row 5, which is the corresponding capital expenditure schedule for the depreciation schedule we are creating. The IF function checks all of the prior periods for a capital expenditure by adding up the row from the historic period up to the prior period. If there is no capital expenditure in the prior periods, then the SUM function will return a zero, which is equal to zero. The IF will take this TRUE statement and return a zero value for the depreciation. If the use of the dollar sign is confusing, refer to the Toolbox section at the end of this chapter.

If the IF function is FALSE, then we need to continue on through the formula:

=IF(SUM($D5:D5)=0,0,IF((Assumptions!$D17-Assumptions!$G17)<=SUM($D13:D13),0

The next part of the formula is another IF function. This IF function tests to see whether the asset created by the capital expenditure has already been completely depreciated. It does so by taking the capital expenditure cost and subtracting the salvage value from the Assumptions sheet. If the amount produced from this subtraction is less than or equal to the depreciation taken on the asset thus far, then there should be no more depreciation and a zero is returned. Once again, the use of the dollar sign within the SUM function is integral and the Toolbox section at the end of this chapter should be referenced if this is unclear. The formula then continues with:

=IF(SUM($D5:D5)=0,0,IF((Assumptions!$D17-Assumptions!$G17)<=SUM($D13:D13),0,IF(inputs_Capex1Dep="Straight Line",SLN (Assumptions!$D17,Assumptions!$G17,Assumptions!$F17)

The logic with this next section is that if the capital expenditure existed in the prior period and all of the depreciation on the asset has not been taken yet, the asset should be depreciated. However, we need one more test since we gave the user the option to depreciate using a straight-line method or a fixed declining balance method. To do this, we use another IF function that checks the named range on the Assumptions sheet where the user selected the depreciation type (inputs_Capex1Dep). If that cell has the value Straight Line, then Excel's built-in straight-line depreciation function, SLN, is used. This function is described in more detail in the Toolbox at the end of this chapter. If the value is different, it means that the user wants to use a fixed declining balance method. We do not need another IF function since the fixed declining balance method is the only other type of method and there can be no more possibilities for the entire formula's return. Prior to implementing the remainder of this formula, we need to create additional functionality for the fixed declining balance calculation.

5. The need for additional functionality for the fixed declining method stems from the calculation's need to know which period of depreciation the asset is experiencing. The mathematical formula uses a compounding calculation to calculate the accelerated figures, which requires us to provide an integer-based compounding number. To do this, we will create a separate section below the depreciation schedules that tracks each asset's depreciation period in integer format. Let's first create labels to guide us. Enter the text **Current Dep Pd** in cell B21 and the following formulas in the corresponding cells:

   B22: **=B13**
   B23: **=B14**
   B24: **=B15**
   B25: **=B16**

	B	C	D	E	F	G	H	I	J
21	**Current Dep Pd**								
22	Capex 1			0	1	2	3	4	0
23	Capex 2			0	1	2	3	4	5
24	Capex 3			0	0	0	1	2	3
25	Capex 4			0	0	0	0	0	0

FIGURE 5.8 In order to implement accelerated depreciation schedules we need to track each asset's depreciation period.

6. The formula to determine which time period of depreciation the asset is in needs to check when the asset was created, in order to determine when to start depreciation. The formula also needs to know when to stop counting, which takes place when the asset has taken its full depreciation. Interestingly, we already created this functionality in the first two IF functions of the partial equation in step 7. All we must do is skip the IF function that determines the depreciation method and then finish off the final result if both conditions of the partial equation are false. These additions are shown in the complete formula we should enter in cell E22:

   =IF(SUM($D5:D5)=0,0,IF((Assumptions!$D17-Assumptions!$G17)<=SUM($D13:D13),0,D22+1))

   Notice that this formula is essentially a counter. It creates zeroes when the asset is in its first year or earlier and when the asset has taken its full depreciation. However, when those conditions are not met, the formula adds a one to the prior period. This has the effect of creating a cumulative counter. This counter is a cumulative count of the asset's depreciation period. Copy and paste this formula over the range E22:J25. The counter should look like Figure 5.8.
7. We can now finish off the depreciation calculation in cell E13. Go back to that cell and complete the partial equation so that it is the following formula:

   =IF(SUM($D5:D5)=0,0,IF((Assumptions!$D17-Assumptions!$G17)<=SUM($D13:D13),0,IF(inputs_Capex1Dep="Straight Line",SLN(Assumptions!$D17,Assumptions!$G17,Assumptions!$F17),DB(Assumptions!$D17,Assumptions!$G17,Assumptions!$F17,E22))))

   The last part of the equation adds in Excel's built-in fixed declining balance function (DB). This function requires all of the information for straight-line depreciation, plus the current depreciation period that we determined in step 6. For more information on the DB function, refer to the Toolbox section of this chapter. Also, make sure to copy and paste the formula created in this step over the range E13:J16.
8. Finally, enter the text **Total Depreciation** in cell B18. Then enter the following formula in cell E18:

   =SUM(E13:E16)

	B	C	D	E	F	G	H	I	J
12	**Depreciation**								
13	Capex 1			-	15.00	15.00	15.00	15.00	-
14	Capex 2			-	4.00	4.00	4.00	4.00	4.00
15	Capex 3			-	-	-	1.60	1.60	1.60
16	Capex 4			-	-	-	-	-	-
17									
18	**Total Depreciation**			-	19.00	19.00	20.60	20.60	5.60

FIGURE 5.9 The depreciation associated with each capital expenditure should calculate automatically.

Copy and paste this formula over the range E18:J18. Figure 5.9 shows what this section should look like.

INTANGIBLES

The concept of an intangible is tough to define considering the word itself describes something that cannot be seen or felt. In finance, intangibles have similar characteristics. Many intangibles derive their value from intellectual creations such as patents, licenses, and trademarks. These assets are legal claims to intellectual property that can add significant value to companies. Some industries such as pharmaceuticals, information technology firms, and film companies build their fortunes around intangibles.

One particular type of intangible is known as *goodwill*, which is the difference between book value and market value. Goodwill captures the concept that an entity might be worth more than just the book value of its assets based on its name recognition, reputation, and branding. For instance, Sony charges a premium over competitors for its products and converts its brand and reputation into real value. The market perceives value in the Sony name, which adds to the company's value.

AMORTIZATION

Just as capital expenditures lose value over time, so do intangible assets. Patents can eventually expire, competitors can catch up technologically, and proprietary processes can become outdated or irrelevant. This reduction in value is known as *intangible amortization*. Be very careful with the term *amortization*, since the word draws its roots from the ending of a life or erosion, which can be used with other concepts in finance such as debt. In the case of intangible amortization, we reduce the value of the intangible each year for a specific number of years.

In fact, most accounting methodologies amortize intangibles in an identical manner as straight-line depreciation. Instead the cost is the cost of the intangible, the salvage value is the value, if any, at the end of the useful life, and the useful life is the perceived duration of intangible value. Typically, accelerated forms of amortization are not allowed by accounting boards. IFRS specifically uses straight-line amortization for intangibles.

One exception to intangible amortization is goodwill. Prior to 2002, IFRS amortized goodwill like any other intangible. That practice was stopped and subsequently replaced with the concept that goodwill must be examined periodically for impairment.

MODEL BUILDER 5.3: INTANGIBLES AND AMORTIZATION SCHEDULES

1. We need to set up some assumptions on the Assumptions sheet. Go to that sheet and enter the following text in the corresponding cells:

   I15: **Intangible Assumptions**
   J16: **Amortization Method**
   K16: **Amt**
   L16: **Intangible Date**
   M16: **Life (years)**
   I17: **Intangible 1**
   I18: **Intangible 2**
   I19: **Intangible 3**
   I20: **Intangible 4**

2. We should also enter some initial assumptions that we can work with. Enter the following values in the corresponding cells:

   J17: **Straight Line**
   J18: **Straight Line**
   J19: **Straight Line**
   J20: **Straight Line**
   K17: **10**
   K18: **5**
   K19: **3**
   K20: **0**
   L17: **12/31/2008**
   L18: **12/31/2009**
   L19: **12/31/2010**
   M17: **3**
   M18: **2**
   M19: **2**
   M20: **0**

   Figure 5.10 shows what the assumptions area should look like.

	I	J	K	L	M	N	O
15	**Intangible Assumptions**						
16		Amortization Method	Amt	Intangible Date	Life (years)		
17	**Intangible 1**	**Straight Line**	**10**	**12/31/2008**	**3**		
18	**Intangible 2**	**Straight Line**	**5**	**12/31/2009**	**2**		
19	**Intangible 3**	**Straight Line**	**3**	**12/31/2010**	**2**		
20	**Intangible 4**	**Straight Line**	**0**		**0**		

FIGURE 5.10 The assumptions for intangibles are created in a similar manner as capital expenditures.

3. Insert a new sheet after the Capex sheet and name it **Intangibles**.
4. On the Intangibles sheet, set up labels for rows by entering the following text and formula references in the corresponding cells:

   A1: **Intangibles**
   B4: **Intangibles**
   B5: **=Assumptions!I17**
   B6: **=Assumptions!I18**
   B7: **=Assumptions!I19**
   B8: **=Assumptions!I20**
   B10: **Total Intangibles**
   B12: **Amortization**
   B13: **=Assumptions!I17**
   B14: **=Assumptions!I18**
   B15: **=Assumptions!I19**
   B16: **=Assumptions!I20**
   B18: **Total Amortization**

5. Create the dates and timing for this sheet by doing the same Vectors sheet reference in the following cells:

   D2: **=Vectors!D9**
   D3: **=Vectors!D10**

   Copy and paste each of these cells across their respective rows to column Z.
6. The next step is to determine the correct amount of amortization in the right time period. This is done with virtually the same formula used for the capital expenditure schedules:

   E5: =IF(E$3=Assumptions!$L17,Assumptions!$K17,0)

   Copy and paste this formula over the range E5:J8. If you are having difficulty with the dollar signs, refer to the Toolbox at the end of this chapter.

	B	D	E	F	G	H	I	J
1	***Intangibles***							
2			Projected ---->					TV Year
3		12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
4	**Intangibles**							
5	Intangible 1		10.00	0.00	0.00	0.00	0.00	0.00
6	Intangible 2		0.00	5.00	0.00	0.00	0.00	0.00
7	Intangible 3		0.00	0.00	3.00	0.00	0.00	0.00
8	Intangible 4		0.00	0.00	0.00	0.00	0.00	0.00
9								
10	Total Intangibles		10.00	5.00	3.00	0.00	0.00	0.00

FIGURE 5.11 The schedule of intangibles takes the data from the Assumptions sheet and lays it out over the projection period.

7. Total each period's intangible amounts by entering the following formula in cell E10:

   =SUM(E5:E8)

   Copy and paste this formula over the range E10:J10. These steps should make the Intangibles sheet look like Figure 5.11.
8. The related amortization schedules present the same concept status issues as depreciation. We need to know when the intangible was created or purchased and when the total expected amortization has been taken. This is done using the following formula in cell E13:

   =IF(SUM($D5:D5)=0,0,IF(Assumptions!$K17-(SUM($D13:D13))=0,0,SLN (Assumptions!$K17,0,Assumptions!$M17)))

   Notice that this formula does not use the named cells, but instead uses relative referencing so the same formula can be used for multiple cells. Also note that the example model has no salvage value for the intangibles. Copy and paste this formula over the range E13:J16.
9. Total up the amortization for each period by entering the following formula in cell E18:

   =SUM(E13:E16)

   Copy and paste this formula over the range E18:J18. The final part of the Intangibles sheet is depicted in Figure 5.12.

INCOME STATEMENT AND BALANCE SHEET EFFECTS

With schedules created for capital expenditures, depreciation, intangibles, and amortization, we should now integrate these figures into our modeling process. The income

	B	C	D	E	F	G	H	I	J
12	**Amoritization**								
13	Intangible 1			0.00	3.33	3.33	3.33	0.00	0.00
14	Intangible 2			0.00	0.00	2.50	2.50	0.00	0.00
15	Intangible 3			0.00	0.00	0.00	1.50	1.50	0.00
16	Intangible 4			0.00	0.00	0.00	0.00	0.00	0.00
17									
18	Total Amortization			0.00	3.33	5.83	7.33	1.50	0.00

FIGURE 5.12 The intangible amortization works similar to depreciation; however, for the most part it is calculated using a straight-line method.

statement is the first section in which we encounter any of these items. Depreciation and amortization are non-cash items that reduce the earnings of a firm. This is due to the idea that when these assets are eventually disposed of the accrued depreciation and amortization must be already accounted for or taken at one single time. Instead, companies are allowed the benefit of spreading this charge over time, which makes sense since items usually lose value over time, not just in one instance. The reduction in earnings due to depreciation and amortization also provides a tax benefit to companies since the amounts are removed prior to paying tax.

On the balance sheet we take a more comprehensive view. Gross fixed assets are tracked each year, which are increased by capital expenditures and decreased by fixed asset disposals. Depreciation for each fixed asset is tracked and added together to form accumulated depreciation. The difference between gross fixed assets and accumulated depreciation is known as the *net fixed assets* of the firm. Similarly, gross intangibles are increased by the intangibles each period and reduced by their disposal. Accumulated amortization is tracked and increased by the amortization each period. The difference between gross intangibles and accumulated amortization produces the net intangible figure. Both net numbers contribute to the total assets of the firm.

MODEL BUILDER 5.4: INTEGRATING CAPITAL EXPENDITURES, DEPRECIATION, INTANGIBLES, AND AMORTIZATION

1. Go back to the Income Statement sheet. Enter the text **Depreciation** in cell B15 and **Amortization** in cell B16.
2. In cell D15, enter the value **5**, and in cell D16, enter the value **2**. These will be our historical assumptions for depreciation.
3. In cell E15 on the Income Statement, enter the following formula:

   =Capex!E18

   Copy and paste this formula over the range E15:J15.
4. In cell E16, enter the following formula:

   =Intangibles!E18

	A	B	C	D	E	F	G	H	I	J
1	**Income Statement**									
2					Projected ---->					TV Year
3				12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
4										
5		Sales units		100.00	105.00	110.25	115.76	121.55	127.63	130.18
6		Sales Price		2.00	2.10	2.21	2.32	2.43	2.55	2.60
7		Sales Revenue		200.00	220.50	243.10	268.02	295.49	325.78	338.94
8		Cost Units		0.50	0.53	0.56	0.60	0.63	0.67	0.71
9		Cost of Goods Sold		70.00	63.00	61.60	68.57	76.31	84.94	91.82
10		**Gross Profit**		130.00	157.50	181.50	199.45	219.18	240.84	247.12
11		SG&A Expense		27.00	30.87	34.03	37.52	41.37	45.61	47.45
12		Operating Expenses		9.30	13.23	14.59	16.08	17.73	19.55	20.34
13		**EBITDA**		93.70	113.40	132.88	145.85	160.08	175.69	179.33
14										
15		Depreciation		5.00	-	19.00	19.00	20.60	20.60	5.60
16		Intangible Amortization		2.00	-	3.33	5.83	7.33	1.50	-
17		**EBIT**		86.70	113.40	110.54	121.02	132.15	153.59	173.73

FIGURE 5.13 Depreciation and amortization are non-cash items that reduce net income on the income statement.

Copy and paste this formula over the range E16:J16. The updated income statement is shown in Figure 5.13.

5. Go to the Balance Sheet sheet and enter the following text in the corresponding cells to create labels:

   B17: **Gross Fixed Assets**
   B18: **Accumulated Depreciation**
   B19: **Net Fixed Assets**
   B21: **Gross Intangibles**
   B22: **Accumulated Amortization**
   B23: **Net Intangibles**

6. Enter the following values to insert historical assumptions:

   D17: 85
   D18: **17**
   D21: 25
   D22: 5

7. Let's complete the capital expenditure and depreciation formulas first. These are cumulative figures that use the prior period's value plus the current depreciation or amortization. Insert the following formulas in their corresponding cells:

   E17: **=D17+Capex!E10**
   E18: **=D18+Capex!E18**

	B	C	D	E	F	G	H	I	J
14	Gross Fixed Assets		**85.0**	195.00	195.0	205.0	205.0	205.0	205.0
15	Accumulated Depreciation		**17.0**	17.00	36.0	55.0	75.6	96.2	101.8
16	Net Fixed Assets		**68.0**	178.00	159.0	150.0	129.4	108.8	103.2

FIGURE 5.14 Gross fixed assets are increased by periodic capital expenditures, while accumulated depreciation is increased by periodic depreciation. The difference between gross fixed assets and accumulated depreciation is net fixed assets.

Copy and paste these formulas over to the J column for each of their respective rows.

8. Net fixed assets are the difference between gross fixed assets and accumulated depreciation. Enter the following formula in cell D19:

   =D17-D18

   Copy and paste this formula over the range D19:J19. Refer to Figure 5.14 for details on how the balance sheet should be developing.
9. Next we will work on the intangibles and amortization. Enter the following formulas in the corresponding cells:

   E21: **=D21+Intangibles!E10**
   E22: **=D22+Intangibles!E18**

   Copy and paste these formulas over to the J column for each of their respective rows.
10. Finally we need to subtract the amortization from the intangibles to get the net figure. Enter the following formula in cell D23:

    =D21-D22

    Copy and paste this formula over the range D23:J23. Similar to Figure 5.14, Figure 5.15 shows the interaction for intangibles.

TOOLBOX

Understanding Dollar Signs

Seeing dollar signs in formulas can be confusing to new financial modelers if they are unfamiliar with Excel conventions. The technical utility of a dollar sign is to change

	B	C	D	E	F	G	H	I	J
18	Gross Intangibles		**25.0**	35.00	40.0	43.0	43.0	43.0	43.0
19	Accumulated Amortization		**5.0**	5.00	8.3	14.2	21.5	23.0	23.0
20	Net Intangibles		**20.0**	30.00	31.7	28.8	21.5	20.0	20.0

FIGURE 5.15 Gross intangibles are reduced by accumulated amortization to calculate net intangibles.

a reference from a relative reference to an absolute reference. In normal-speak, a dollar sign *locks* a cell reference so the reference does not change when the formula the reference is created in is dragged. As an example, imagine the following formula in cell C5 of any sheet:

=A1+B1

If C5 is dragged or copied to the right one cell, then the formula's references will change to B1+C1. However, if we put dollar signs in front of the rows and columns, such as in the case of \$A\$1+\$B\$1, we can lock the reference. Now when cell C5 is dragged or copied to the right one cell the formula's references remain \$A\$1+\$B\$1. Figure 5.16 shows the difference between these two methods.

In the previous example we did not actually have to put dollar signs in front of both the row and column references. Since we were dragging the cell to the right, we were moving only across columns. We could have locked the reference by entering \$A1+\$B1. However, if we dragged cell C5 down one cell, the row reference would change and the formula in cell C6 would be \$A2+\$B2. We could do the opposite and put dollar signs only in front of the row references, such as A\$1+B\$1. Now when cell C5 is dragged down the references will not change, but when cell C5 is

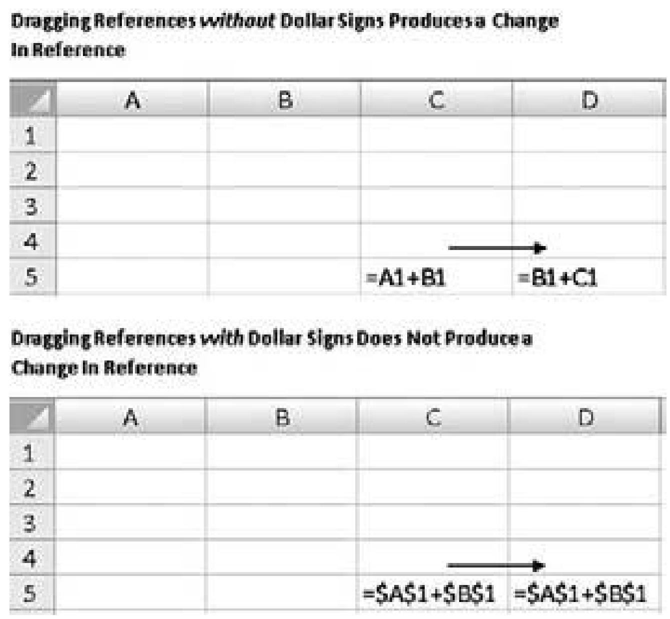


FIGURE 5.16 Using dollar signs changes a reference from relative to absolute.

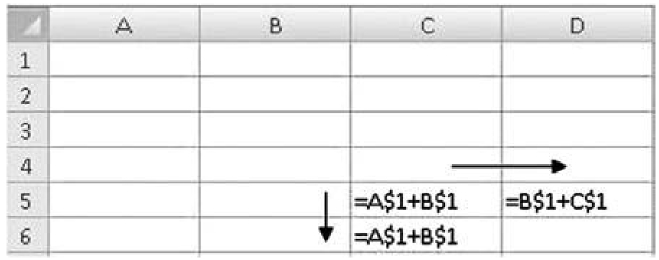


FIGURE 5.17 Dollar signing in front of the rows will prevent the row numbers from changing when the reference is dragged down, but will have no effect on the columns when dragged across.

dragged, say, one cell to the right, the formula will change to B$1+C$1. Figure 5.17 shows this dragging example.

Dollar signs are used in this chapter because we want to use one formula for multiple capital expenditure and intangible items on the Assumptions sheet. Each capital expenditure or intangible is organized with different types of information going across columns, with each capital expenditure or intangible having its own row. Therefore, if we want to reference different characteristics of the capital expenditure or intangible, such as amount or date, we would want to have a dollar sign in front of the column, but not row. Conversely, we want to reference the dates on either the Capex or Intangibles sheet in the schedule formulas, but as we drag those formulas down rows we do not want the row reference to change. Therefore, we put dollar signs in front of the rows for this reference, but not in front of the columns since we want to reference a new date each period. Figure 5.18 shows the organization of the assumptions that need to be worked around with dollar signs.

Dollar Signs and Arrays

Dollar signs can also be used with functions that accept arrays. First, what is an array? An *array* is more than one cell of data, which can be a single column list or a matrix of data. For the most part, Excel functions that work with arrays work only with single-column or -row arrays. Many of us are already familiar with functions that work with arrays, such as the SUM or AVERAGE function. All it means is that the function can accept and return a value with multiple continuous cells of data as inputs.

The typical reference for an array is to use the starting cell reference, a colon symbol, and then the ending cell reference. For instance, range C5:G5 would reference cells C5, D5, E5, F5, and G5. Or it could be interpreted as saying "for each cell in the range of cells C5 to G5."

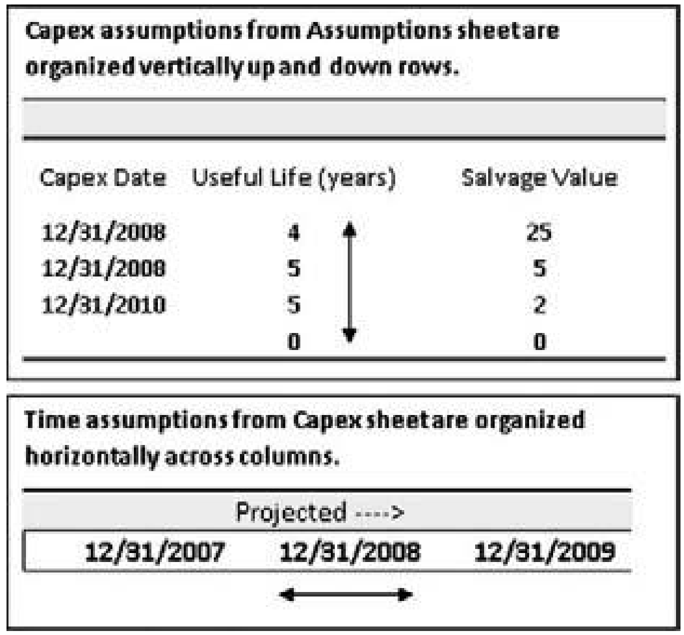


FIGURE 5.18 Dollar signs are required to reference data correctly between the Assumptions and Capex sheets.

As with any cell reference, array references are relative and change as they are dragged. So imagine the following formula in cell G10:

=SUM(C5:G5)

If cell G10 was dragged one column across to cell H10, the formula in cell H10 would read:

=SUM(D5:H5)

Now, many people have guessed that you could write the following to lock down the reference:

=SUM($C$5:$G$5)

This previous formula would be locked down, but what is interesting is that we have the option of locking down only one of the two cell references in the range. For example, in cell G10 we could enter:

=SUM($C$5:G5)

When the previous formula is dragged one column to the right to cell H10, the reference will change to:

=SUM($C$5:H5)

	C	D	E	F	G	H
5	5	8	10	12	8	7
6						
7						
8						
9						
10					=SUM($C$5:G5)	=SUM($C$5:H5)

FIGURE 5.19 The formula in cell G10 returns a sum of 43. When cell G10 is dragged to cell H10, the initial location of the reference is locked and picks up the additional 7, to return a total of 50.

Notice that the first part of the reference is locked, while the second part is not and changes. This will increase the array reference and sum up anything in cell H5, but not move the original starting point. In finance, this method is frequently used to calculate cumulative figures. Figure 5.19 shows this example with numbers to assist in the explanation.

Depreciation Functions: SLN, DB, DDB, SYD

SLN (Straight Line Depreciation) There are numerous prebuilt depreciation functions in Excel. In this section, we will cover four of the most commonly used ones. The first is the SLN function, which calculates straight-line depreciation. Earlier we provided the mathematical formula for straight-line depreciation. The SLN function's entry parameters are as follows:

=SLN(Cost, Salvage Value, Useful Life)

Always keep in mind the problem absolute referencing causes with this function. The function on its own does not know when to turn off depreciation as it is dragged across time periods. This problem is mitigated by using the formula created in step 4 of Model Builder 5.2.

DB (Fixed Declining Balance Depreciation) Given that some assets do not depreciate in equal amounts each period, accelerated depreciation calculations try to create an organized method for determining unbalanced depreciation. A common method is the fixed declining balance depreciation method. The entry parameters for this function include:

=DB(Cost, Salvage Value, Useful Life, Current Depreciation Period, Month)

Most of the entry parameters are the same as the SLN function except for the last two. The current depreciation period is the period of depreciation for the asset, *not* the current period of the model. The optional month parameter is if the asset begins and ends depreciation on a partial-year basis. You can select the month numerically if this is the case.

There is a minor problem with the DB function that can become a major problem in financial modeling. The DB function rounds results to the third decimal place. This can cause too much depreciation to be taken. If too much depreciation is taken, then the cost minus the salvage value, less the depreciation, will be a negative number. This can cause errors to propagate throughout a model. The suggested fix for this issue is to recreate the DB function mathematically and not use rounding. This can be done by entering the following formula rather than the DB function:

=(Cost-SUM(Prior Depreciation Amounts))*(1-((Salvage Value/Cost)^(1/Useful Life)))

DDB (Double Declining Balance Depreciation) In some cases the fixed declining balance method of accelerated depreciation does not accurately capture the expected depreciation of the asset. To account for this Excel has a host of other depreciation functions. A common alteration to the formula is to accelerate the rate of depreciation by a factor of two, which is known as the *double declining balance method*. The DDB function calculates this amount using the following entry parameters:

=DDB(Cost, Salvage Value, Useful Life, Current Depreciation Period, Factor)

The only new element in this function is the Factor, which is two in the case of double declining or three for triple declining, and so on. I have rarely used this formula and have never had to alter the factor to anything greater than 2. For those who follow U.S. GAAP accounting, you should be mindful that GAAP does not allow accelerated depreciation to dip below the equivalent straight-line depreciation. One could account for this using a MAX function or implement the VDB function, which takes care of this problem.

SYD (Sum of the Years' Digits Depreciation) The final depreciation method we will discuss is sum of the years' digits. This is an accelerated form of depreciation that is faster than straight line, slower than a fixed declining method in the early periods, but faster in later periods. Conceptually it can be thought of as a more *smoothed* version between straight-line depreciation and fixed declining balance methods. Sum of the years' digits is officially calculated using the following formula:

(2 * (Useful Life – Current Depreciation Period + 1)*(Cost-Salvage Value))/ **(Useful Life * (Useful Life + 1)**)

Alternatively, we could use the SYD function in Excel, which is much easier. The entry parameters for this function include:

=SYD(Cost, Salvage Value, Useful Life, Current Depreciation Period)

6

Long-Term Debt

Long-term debt is one of the most looked-at items on a balance sheet. It is scrutinized for many reasons: Bankers often issue or monitor long-term debt extended to entities, treasury groups look at their own company's leverage to make sure they are optimally funding the company, and anyone involved in understanding the credit risk of a firm is looking at long-term debt since its characteristics contribute dramatically to default risk. Regardless of perspective or reason, analyzing long-term debt requires thorough explanation and study because it can be very complicated to model debt schedules correctly. Even more complicated is integrating debt schedules into a fully dynamic model. Our approach in this chapter will be to first look at the core concepts of debt and then learn how to implement and integrate long-term debt into the example model through Model Builder examples.

WHAT IS LONG-TERM DEBT?

First, we should understand what bankers issue that constitutes long-term debt. This is usually broken down into two separate subcategories: loans and bonds. Loans are typically issued between a bank and the company. Long-term loans have a maturity greater than 12 months from the analysis date and have detailed documentation that guides the payment of interest and principal each period. This documentation also directs the payment priority when multiple issuances of debt are created. Similarly, bonds with maturities greater than 12 months are liabilities of the company that require interest and principal payments. However, bonds are issued and sold to many different investors and are guided by a document known as a *bond indenture*.

USING DEBT FOR A REASON

As we explore the components of debt instruments in the Model Builder examples, some will ask, "Why go through all this trouble? Why not just fund the entire company with personal funds or equity?" The easy answer is that there may not be enough equity investors to feasibly fund the entire company. A more complicated

	Debt	Equity
Priority of Payment	Debt usually paid over equity	Equity can be locked out after debt
Claim on Firm	Higher priority in liquidation	Priority after debt in liquidation
Tax Shield	Interest tax deductible	Dividends paid after tax

FIGURE 6.1 In most cases, long-term debt is cheaper and more secure than equity.

answer is that debt is cheaper than equity and is therefore an attractive method of funding a company.

Debt is less expensive to fund a company with than equity for a number of reasons. The first and most transparent reason is the tax shield that debt interest enjoys according to major accounting methodologies. Debt interest is removed from taxable income, thereby reducing the effective debt rate. The second reason debt is less expensive than equity is because debt is given priority over equity in terms of the company's cash flow and cannot demand as much compensation for risk as equity holders. Before equity can receive dividends, most debt holders must be paid their interest and, depending on covenants, any principal that is due. The more secure the cash flow, the less risk and therefore the less reward. Figure 6.1 summarizes these differences.

However, risk does exist, particularly if a company is unable to make interest and/or principal payments to debt holders. When this occurs, the company is thought to be in default of its liabilities. Defaulting on liabilities is a precarious situation because most loan or bond documentation gives debt holders powerful rights in relation to the control of the company. Essentially, debt holders are given control to either work out the cash flow problems or send the firm into liquidation in order to recover their debt investment from liquidation proceeds.

We can see from the previous reasoning above why it is incredibly important to model debt correctly. The first step in modeling debt is calculating what is due to debt holders each period. Creating these debt schedules is the basis for multiple auxiliary calculations. The second step is determining how much of what is due can be paid. This can be very complicated, depending on the number of debt issuances a company must service and the priority structure that exists between the debt issuances. The final step is integrating the paid debt schedules into a dynamic cash flow model, which can be challenging when trying to determine interest and principal sources.

MODELING DEBT: DEBT COMPONENTS IN DETAIL

Prior to jumping into a Model Builder to begin our creation and integration of long-term debt in the example model, we should learn about common characteristics of debt. Naturally, there can be variations in the market depending on regional and industry-specific factors, but most debt has the following factors:

- *Issuance date:* This is the date that the debt principal is issued. Interest is calculated from this date forward. For financial modeling, we must be aware that there can be three time perspectives of debt: historical debt that was issued prior to the date the model is built, debt under immediate analysis that is being issued in conjunction with the creation of the model, and also future debt that will be issued in future projection periods. Often entire models are built to examine debt issuances, which means that the issuance dates correspond to the first model date. In such cases, the periodicity is also determined by the periodicity of the debt.
- *Maturity date:* This is the date that the debt is scheduled to return all principal to the investor. Maturity dates are important, but they should not be confused with other metrics of debt exposure and time such as weighted average life and duration.
- *Balance:* The balance is the principal amount of the loan or bond issuance. This amount should not include any interest unless it has been previously capitalized. Also, keep in mind that historical debt may have different current balances than at issuance since the balance may have amortized since issuance.
- *Rate:* The major incentive for someone to issue debt is to earn a return. This is done in the form of interest payments. The rate at which an entity pays interest is a combination of factors. For fixed rate issuances the underlying rate is the risk-free rate. Nearly all entities are not risk free and therefore have default risk. To compensate debt holders for this default risk, a spread is charged over the risk-free rate. This spread is a complex calculation involving the creditworthiness of the firm, expectations regarding future performance, and market opinions.

  Funding a company using a fixed rate can be problematic since the cash flow the company earns could be correlated to market interest rates. Take a financial institution with financial assets as an example. If the institution is funded with a fixed rate and the assets generate cash flow based on a floating rate, the company will be distressed if market rates decrease below the fixed funding rate.

  To cope with differences of rates between income generation and funding, known as *basis risk*, swaps or derivatives can be used or the company can fund itself using floating-rate instruments. Floating-rate debt charges interest based on an index, plus a spread. The index can be a common international one such as LIBOR, or for more localized transactions it would be a regional rate such as the Bank Bill Swap Bid Rate (BBSY) in Australia or Tasa de Interés Interbancaria de Equilibrio (TIIE) in Mexico. Just as with a fixed rate, a floating rate also includes a spread that is charged to capture the credit risk of the entity borrowing funds.

Date	Market Rate	Fixed Rate Locked in First Period with 1.25% Margin	Floating Rate with a 1.25% Margin	Floating Rate with a 1.25% Margin and a Cap at 2.85%
9/1/2009	1.50%	2.75%	2.75%	2.75%
10/1/2009	1.53%	2.75%	2.78%	2.78%
11/1/2009	1.55%	2.75%	2.80%	2.80%
12/1/2009	1.58%	2.75%	2.83%	2.83%
1/1/2010	1.60%	2.75%	2.85%	2.85%
2/1/2010	1.63%	2.75%	2.88%	2.85%
3/1/2010	1.65%	2.75%	2.90%	2.85%
4/1/2010	1.68%	2.75%	2.93%	2.85%

FIGURE 6.2 Market rates change based on the economy, while individual company debt rates can lock in at certain points, float, or use a derivative to limit fluctuations. All corporate rates typically have a risk margin added to them.

Interest rate movements and their effect on debt can be very complex depending on the exact documentation for the debt product. Floating-rate structures can have variable payments or keep the payments the same and have variable terms. Pricing for debt changes depending on market rates and can often incentivize or disincentivize issuance, investment, or debt trading. Figure 6.2 compares fixed and floating rates in relation to debt.

- *Term:* The amount of time between the issuance date and the maturity date is the term. The term of the debt can often dictate the forecast period of the model if the model is being created by a debt banker. The term in the example model is represented in months since, as we saw from the initial date and timing setup, it is easier to work with months in Excel.
- *Payment type:* Debt can pay down or amortize in a number of ways. The most common amortization method is simple level principal amortization. This takes the original principal amount and divides it evenly by the term. Amortization could occur at any interval of time, such as on an annual basis as seen in the example model.

  Frequently, companies want to time the amortization of principal that they owe, so it is more manageable to work with revenue inflows. *Bullet amortization* schedules can be created, where specific percentages of debt are due at certain intervals of time. Often, bullet amortizations become *balloon* amortizations where large amounts or balloon payments are due at maturity. These amounts are typically refinanced.

  Another major payment style is level payment amortization. This may sound similar to the first type of amortization above, but level payment amortization is focused on the payment, which is composed of both interest and principal

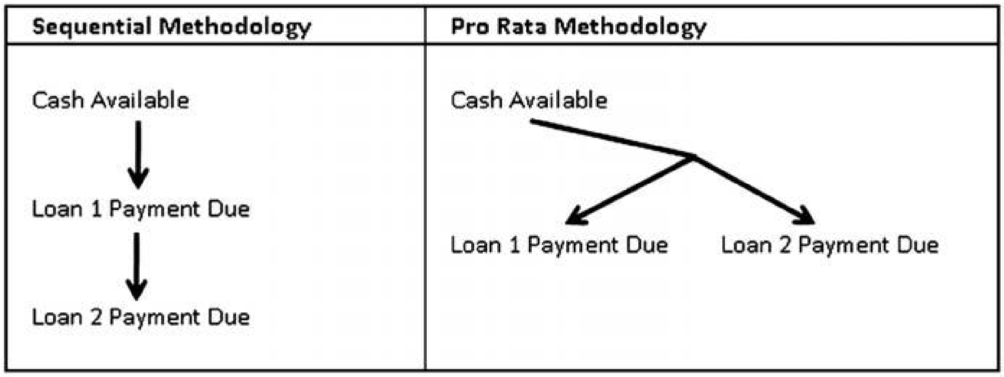


FIGURE 6.3 Sequential debt pays in order while pro rata debt pays at the same time.

components. A level payment is typical of consumer-type debt, where a borrower strives to pay the same amount each month.

- *Payment priority:* When a company borrows multiple times there can be more than one instrument of debt outstanding at a given time. This creates an issue of payment priority since debt has priority of cash flows over equity. However, which debt instruments have priority of debt over each other? The most standard setup is to borrow funds and then any additional borrowings are subordinate in cash flow priority to the older borrowing. This is known as a *senior subordinate structure*, where senior debt gets its funds first, followed by the subordinate debt. The debt is known to pay in a sequential manner. If there is a shortfall, then the senior loan gets paid prior to the subordinate loan.

  An alternative to sequential debt is *pro rata* or *pari passu* debt, which gets its name from the Latin translation "by rate of" or "by change of." Pro rata debt is where there are two or more issuances of debt that have equal priority. The debt is known to pay in a concurrent manner. This means that cash flow is paid to each debt instrument as it is due; but if there is a shortfall, then the shortfall is shared equally, depending on principal balance or possibly what each debt issuance is owed. Refer to Figure 6.3 for a graphical overview of the two methods.

MODEL BUILDER 6.1: SETTING UP DEBT AND CALCULATING WHAT IS DUE

1. We need to get some debt assumptions into the model. Insert a worksheet after the Intangibles sheet and name it **Debt**. Enter the text **Debt** in cell A1 of the newly created sheet.
2. Enter the following text in the corresponding cells to establish labels for the Debt sheet:

   A1: **Debt**
   B3: **Long-Term Debt Assumptions**
   B4: **Debt Issuance**

D4: **Rate**
E4: **Spreads**
F4: **Term**
G4: **Balance**
H4: **Issue Date**
I4: **Maturity Date**
J4: **PMT Type**
K4: **Priority**
L4: **Pro Rata Seq**

3. Notice that we are creating fields for assumptions directly on the Debt sheet rather than the Assumptions sheet. This is because we will be heavily focused on Debt and will want to work in this sheet frequently. If a user is not as concerned by debt, but rather by other areas of the model, she should expand the area of the model that she is most focused on and enter specific assumptions in that area. For now, we will focus on debt and enter initial values for assumptions in the corresponding cells:

   B5: **1**
   B6: **2**
   B7: **3**
   E5: **2.35%**
   E6: **2.50%**
   E7: **2.58%**
   F5: **36**
   F6: **48**
   F7: **60**
   G5: **5**
   G6: **10**
   G7: **20**
   H5: **12/31/2008**
   H6: **12/31/2008**
   H7: **12/31/2008**
   I5: **12/31/2011**
   I6: **12/31/2012**
   I7: **12/31/2013**
   L5: **1**
   L6: **1**
   L7: **1**

   Keep in mind that we skipped a few columns. Those columns were skipped because the assumptions will get their values from data validation lists that we need to create first. Another nuance that some might notice is we put hard-coded values in for both term and maturity date. Theoretically, when the term changes,

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Debt**											
2												
3		**Long-Term Debt Assumptions**										
4		Debt Issuance		Rate	Spreads	Term	Balance	Issue Date	Maturity Date	PMT Type	Priority	Pro Rata Seq
5		1			2.35%	36	5	12/31/2008	12/31/2011			1
6		2			2.50%	48	10	12/31/2008	12/31/2012			1
7		3			2.58%	60	20	12/31/2008	12/31/2013			1

FIGURE 6.4 Since debt is often a key factor in a model, the debt assumptions will be located directly on the debt sheet.

the maturity date should change or vice versa. For now, let's leave them both as hard-coded values and keep in mind that they should be consistent. Thus far the model should look like Figure 6.4.

We should also go through and name each assumption. Name the following cells with the corresponding names:

E5: **debt_Debt1Spd**
E6: **debt_Debt2Spd**
E7: **debt_Debt3Spd**
F5: **debt_Debt1Term**
F6: **debt_Debt2Term**
F7: **debt_Debt3Term**
G5: **debt_Debt1BegBal**
G6: **debt_Debt2BegBal**
G7: **debt_Debt3BegBal**
H5: **debt_Debt1BalDate**
H6: **debt_Debt2BalDate**
H7: **debt_Debt3BalDate**
I5: **debt_Debt1MatDate**
I6: **debt_Debt2MatDate**
I7: **debt_Debt3MatDate**
L5: **debt_Debt1PRSeq**
L6: **debt_Debt2PRSeq**
L7: **debt_Debt3PRSeq**

4. Let's create the information needed for the data validation lists by first going to the Hidden sheet. On the Hidden sheet enter the following text in the corresponding cells:

A18: **lst_PaymentType**
A19: **Level**
A20: **Bullet**
A22: **lst_Priority**

A23: **Sequential**
A24: **Pro Rata**

Name the range A19:A20 **lst_PaymentType** and range A23:A24 **lst_Priority.**

5. We can now go back to the Debt sheet and create data validation lists. In cells J5, J6, and J7, create data validation lists using lst_PaymentType as the source for each list. Similarly, in cells K5, K6, and K7, create data validation lists using lst_Priority as the source for each list. Set the J values to Level and the K values to Sequential for now. Name the following cells with the corresponding names:

   J5: **debt_Debt1PayType**
   J6: **debt_Debt2PayType**
   J7: **debt_Debt3PayType**
   K5: **debt_Debt1Priority**
   K6: **debt_Debt2Priority**
   K7: **debt_Debt3Priority**

6. We will next create a data validation for the rates. This is a special list since it is contained on the Vectors sheet and should be referenced directly there. However, we have yet to create any interest rate information on the Vectors sheet and should do that first. Go to the Vectors sheet and enter the following text in the corresponding cells:

   B33: **Interest Rates**
   B34: **10Y U.S. Treasuries**
   B35: **Euribor**
   B36: **3M Libor**
   B37: **1M Libor**

   Name the range B34:B37 **lst_InterestRates**.

7. Since interest rates can change in sensitivity analysis, we should also create labels for each of interest rates for each scenario below the current/live scenario. Enter the following formula in the cell references below:

   B64, B95, B126: **=B33**
   B65, B96, B127: **=B34**
   B66, B97, B128: **=B35**
   B67, B98, B129: **=B36**
   B68, B99, B130: **=B37**

8. Refer to the assumptions entered on the Vectors sheet of the CD-ROM for each scenario (Base Case, Upside Case, and Downside Case) interest rate value. This should be done particularly if you want to follow along and compare numerical results between the version you are building and the complete example

	A	B	C	D	E	F	G	H	I	J
33		**Interest Rates**								
34		10Y U.S. Treasuries			3.00%	3.50%	4.00%	4.50%	5.00%	5.50%
35		Euribor			4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
36		3M Libor			6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
37		1M Libor			4.20%	4.20%	4.20%	4.20%	4.20%	4.20%

FIGURE 6.5 The interest rates are stored on the Vectors sheet and also can change between scenarios.

model. These values can always be changed later. This section should look like Figure 6.5.

9. We need to create the functionality to change the interest rates in the current/live scenario, when the scenario is changed on the Assumptions sheet. This is done by entering the following formula in cell E34:

   =CHOOSE(ctrl_ScenNmbr,E65,E96,E127,E158)

   Copy and paste this formula over the range E34:J37.
10. With the interest rate assumptions entered, we can go back to the Debt sheet and create data validation lists for the user to select an index for each debt issuance. On the Debt sheet, create data validation lists in cells D5, D6, and D7 using the named range lst_InterestRates as the source of the list. Select **1M Libor** as the initial value for each cell in range D5:D7. Make sure to name the following cells with the corresponding names:

    D5: **debt_Debt1Rate**
    D6: **debt_Debt2Rate**
    D7: **debt_Debt3Rate**

11. We are close to actually doing some debt calculations, but have more prep on the Debt sheet. Dates and timing are incredibly important for debt, and just as with other sheets we should reference the dates and timing from the Vectors sheet. On the Debt sheet, enter the following references in the corresponding cells:

    D11: **=Vectors!D9**
    D12: **=Vectors!D10**

    Copy and paste cell D11 over range D11:Z11 and cell D12 over range D12:Z12.
12. The next step is creating the first debt issuance. As mentioned earlier, we will approach this conceptually by first determining how much debt is due. The formulas in this section can get complicated because of the numerous variations that debt can exhibit, but we will take a step-by-step approach and break down complicated formulas into understandable segments. Also the principal formulas will have to be left incomplete temporarily since their full functionality depends

on a balanced model where we know how much surplus cash exists. We will come back to finish these formulas in Chapter 7. Readers should be cognizant that we will focus on Debt 1 as a primary example and that many of the steps can be repeated for Debt 2 and Debt 3. There will be a few instances when formulas will differ between debt issuances, but these will be pointed out in detail. Let's start the actual debt calculations by entering the following text in the corresponding cells:

B15: **Debt 1**
B25: **Debt 2**
B35: **Debt 3**
B16: **Debt 1 Rate**
B26: **Debt 2 Rate**
B36: **Debt 3 Rate**
B17, B27, B37: **Interest Due**
B20, B30, B40: **Custom Prin Amort %**
B21, B31, B41: **Principal Due**

13. Each debt issuance's interest rate is selected by the user on the Debt sheet. For Debt 1, the user selects an index in cell D5 and enters a spread value. Each period the projected index's rate could change depending on the assumptions from the Vectors sheet. We need to create functionality that looks up the correct interest rate from the Vectors sheet depending on the index selected on the Debt sheet and the time period.

This can be accomplished using the OFFSET MATCH combination, our most powerful lookup method. This method was first seen in Chapter 2, when we created a formula that returned the number of months between periods in cell B8 of the Hidden sheet. This cell changed when the user selected a periodicity in cell D10 on the Assumptions sheet. This method was also described in detail in Chapter 2's Toolbox.

For the case of the interest rates, we will offset the interest rates in the current/live section of the Vectors sheet by a value that is returned by matching the user-selected interest rate against all rates. On the Debt sheet, enter the following formula in cell E16:

=OFFSET(Vectors!E$33,MATCH(debt_Debt1Rate,lst_InterestRates,0),0)+ debt_Debt1Spd

Breaking this formula apart, we see that the OFFSET sets its reference on cell E32 of the Vectors sheet. Notice that this cell is directly above the possible interest rates for the first projection period. The next part of the formula uses the MATCH function to return the ordinal value of the index the user selected on the Debt sheet (debt_Debt1Rate) in the list of all possible interest rates (lst_InterestRates). Since this is an exact MATCH, do not forget to finish off the

MATCH function with the 0 parameter at the end. To finish off the OFFSET function, make sure to include a 0 at the end for the column parameter. Since this formula will be dragged across each period we do not want to offset any columns; we want to offset only vertically to get the correct rate depending on the selected index. Finally, the last bit of the formula adds the spread for Debt 1. Copy and paste this formula over the range E16:J16. Replicate this formula for Debt 2 and Debt 3 in rows 26 and 36 respectively. Make sure to change all references so they are applicable to the correct tranche of debt. Figure 6.6 visually depicts these connections.

14. Let's test this new functionality and explain some of the flexibility of implementing such a rate-lookup system. On the Debt sheet, change the Debt 1 Rate in cell D5 from 1M Libor to **3M Libor**. This should change the interest rates in range E16:J16 so that they reflect the 3M Libor assumption from the Vectors sheet, plus the spread on the Debt sheet in cell E5.

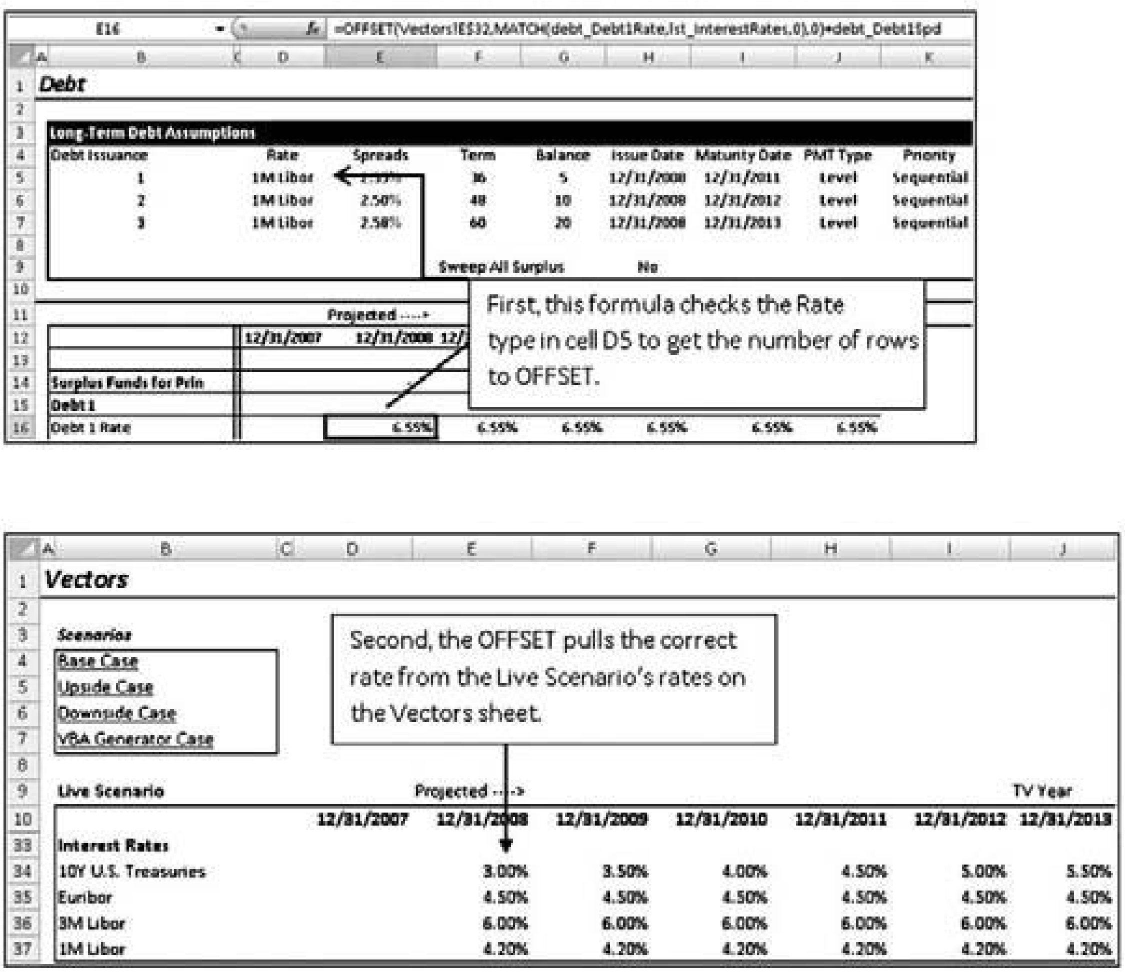


FIGURE 6.6 The OFFSET MATCH combination works well to manage interest rates.

What if a user wanted to store more than just four rates in the model? A powerful benefit of the method we implemented is the scalability of using named ranges, referencing, and lookup functions. Go to the Vectors sheet and insert a row between rows 34 and 35. Enter a new interest rate index by entering the text **BBSY** in cell B35. We will want to have versions of this rate for each scenario, so insert rows between 66 and 67, 98 and 99, and 130 and 131. Note that these instructions assume the reader inserts each row starting from the top of the sheet; otherwise, the cell references above may be slightly different.

For each newly inserted row, enter the text **BBSY** for each B column reference. Next, enter proxy values for each scenario. These should be made up since this is a test of functionality and not part of the complete example model. Back on row 35, enter the lookup functionality created by the CHOOSE function and reference each scenario's interest rates depending on the scenario number from the Hidden sheet (which the user selected from the Assumptions page). Now, go back to the Debt sheet and select the data validation list in D5. BBSY should appear as the second rate on the available interest rates. When it is selected, the rates for Debt 1 on the Debt sheet should reflect the current scenario's BBSY assumptions that are populated in the current/live section of the Vectors sheet. This addition is depicted in Figure 6.7.

It is very important to understand that the data validation list picked up the new interest rate because it was inserted *between* the boundaries of the named range lst_InterestRates. While we could introduce functionality for picking up new values in named ranges that are entered at the end of the named ranges, we will use the simpler method of inserting new items between named ranges. Also keep in mind that by entering the new interest rate name the ordinal values of the items on the list below the newly inserted item increase by 1. This is all taken care of automatically through the use of the OFFSET MATCH combination on the Debt sheet.

Some readers may also notice that we discussed fixed-rate issuance earlier in this chapter, but seem to have implemented only a floating-rate system. The current setup of the model is quite easy to integrate fixed rates. Use the same

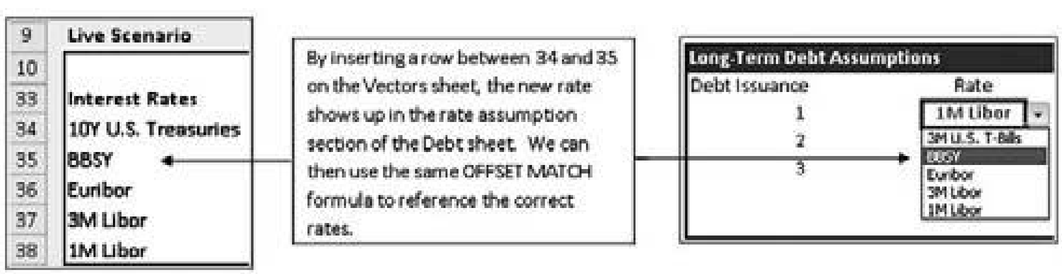


FIGURE 6.7 By using a combination of data validation lists and lookup functions we can easily scale the model to accept additional data points.

method as previously, where a row is inserted on the Vectors sheet between cells B34 and B37, name it **Fixed Rate**, and enter the same fixed-rate assumption each period. Make sure to zero out the spread on the Debt sheet for fixed-rate issuances, unless your intention is to put a fixed base rate and then a margin on the Debt sheet.

At this point, in order to adhere to the example model provided on the CD-ROM, you should delete any additional interest rates that you added to test the scalability. If you choose to leave the additional interest rates in the model, there will be a number of references on the Vectors sheet that will differ from the text.

15. Now that we have an interest rate each period to reference, we are nearly set to calculate the interest due. However, the interest due is composed of two parts, the interest rate and the principal balance outstanding. We should take a moment to create the periodic balances for the debt. The periodic balance for each debt issuance tracks the balance, which could change as principal is repaid. This will be done below all of the debt schedules on the Debt sheet. Enter the following text and references in the corresponding cells to set up labels for the debt balances:

B47: **BOP Balances**
B48: **=B15**
B49: **=B25**
B50: **=B35**
B52: **EOP Balances**
B53: **=B15**
B54: **=B25**
B55: **=B35**

BOP in *BOP Balances* stands for *beginning of period*; *EOP* stands for *end of period*. Be very careful with debt balances since amortization and possible interest capitalization can change balances between periods. Also, be cognizant to never reference items in the future. For instance, once we create the EOP Balance for Debt 1 we should never reference the EOP Balance in the period that is being used to calculate it. This is a common mistake and will create circular references.

16. Next we can get the correct beginning-of-period balance for Debt 1 by thinking about the concept status and entering the following formula in cell D48 on the Debt sheet:

=IF(D12<debt_Debt1BalDate,0,C53)

This formula checks the concept status by referencing the current period's date (cell D12) and seeing whether it is less than the issuance date (debt_Debt1BalDate). If this is the case, we are in a time period prior to issuance and there is no beginning balance (0). Otherwise, the beginning balance is last year's ending balance, which we will create in the next step. Copy and paste this formula over the range D48:J48.

17. Determining the end-of-period balance is more challenging. We will enter the full formula now, but it will reference cells that we have not created yet. The logic will be explained now and further as concepts that relate to this formula are introduced. Enter the following formula in cell D53 on the Debt sheet:

=IF(D12<debt_Debt1BalDate,0,IF(D12=debt_Debt1BalDate,debt_Debt1 BegBal,D48-D22+D19))

Let's break this formula down by each section. First, an IF function is used just as in the BOP Balance section in order to determine the concept status. If the current period's date is less than the issuance date, then there is no balance. However, we quickly deviate from the BOP Balance formula by immediately implementing another IF function that tests the current date to see whether it is equal to the issuance date. If this is the case, then the end-of-period balance is whatever the user entered as the beginning balance of Debt 1 in cell G5. If we are in a period greater than the issuance date, then we should see what the beginning balance of the loan is (cell D48) and subtract out any principal amortization paid (cell D22) and add any unpaid or capitalized interest (cell D19). Unpaid interest and principal payment will be addressed later in this chapter. Copy and paste this formula over the range D53:J53. This process can be replicated for Debt 2 and Debt 3 by making sure to change all assumptions and schedule references to the applicable columns and rows. Figure 6.8 shows the creation of the first few periods of balances.

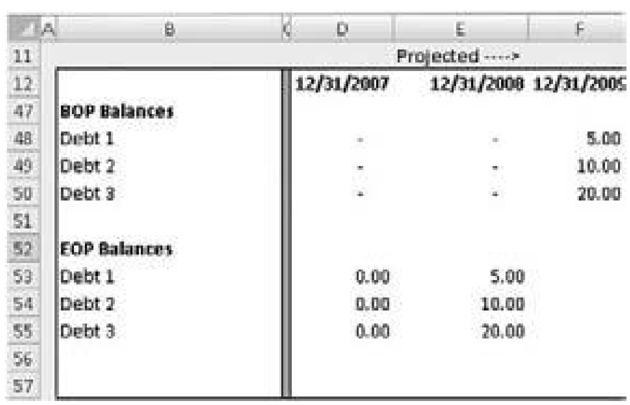


FIGURE 6.8 The debt balances should be tracked from a beginning-of-period and end-of-period viewpoint.

18. We can now go back to the interest due section on the Debt sheet and enter the following formula in cell E17:

    =E48*E16

    Copy and paste this formula over the range E17:J17. This formula multiplies the beginning-of-period balance by the current periodic interest rate. A key word in the previous sentence was *periodic*. Notice that this model is set up to an annual periodicity. If it is changed to anything else, the rates need to be adjusted on the Vectors sheet so they reflect the correct periodicity. One can attempt to automate this process with entering only annual rates and using a divisor based on the periodicity, but it is not very complex to just enter the correct periodic rate on the Vectors sheet. One other point is that the interest amount is temporarily going to be excessively high each period since the debt balance does not change each period, because we have yet to create the principal amortization. This section can be replicated for Debt 2 and Debt 3 at this point.
19. Paying interest will be discussed later in this chapter, so we should now turn to principal due calculations. The first section we should develop is in the instance of custom bullet amortization, where percentages of original balance are due during the projection period. For this we will create a row of percentage assumptions that the user can customize. Enter 0.00% for now in each cell in the ranges E20:J20, E30:J30, and E40:J40.
20. The principal due formula will be one of the most complex formulas in the entire example model. It will be created in multiple steps that will continuously add functionality. The most basic functionality that we want to create is calculating the correct principal due given two possible amortization methods: level principal or bullet principal. Enter the following formula in cell E21 on the Debt sheet:

    =IF(debt_Debt1PayType="Level",MIN(debt_Debt1BegBal/(debt_Debt1Term/ctrl_Periodicity),D53),min(E20*debt_Debt1BegBal,D53))

    This formula first looks to the user-selected principal payment type (debt_Debt1PayType) and checks whether a level principal method is selected. If this is the case, then the principal is calculated by dividing the beginning balance of Debt 1 (debt_Debt1BegBal) by the monthly term (debt_Debt1Term), further divided by the numerical periodicity (ctrl_Periodicity). This figure is within a MIN function that takes the minimum of the previously calculated principal amount and the prior period's principal balance. This MIN function is necessary for two reasons: (1) When there is no balance, there is no principal payment due, and (2) if the principal balance goes off schedule due to principal prepayment, then the MIN function ensures that no more principal is paid in a given period than the principal balance at the beginning of the period. No one will pay more than they owe. Note that it is my habit to reference the prior period's end-of-period principal balance, which is essentially the same as the current period's principal balance. These references can be used interchangeably based on your preference.

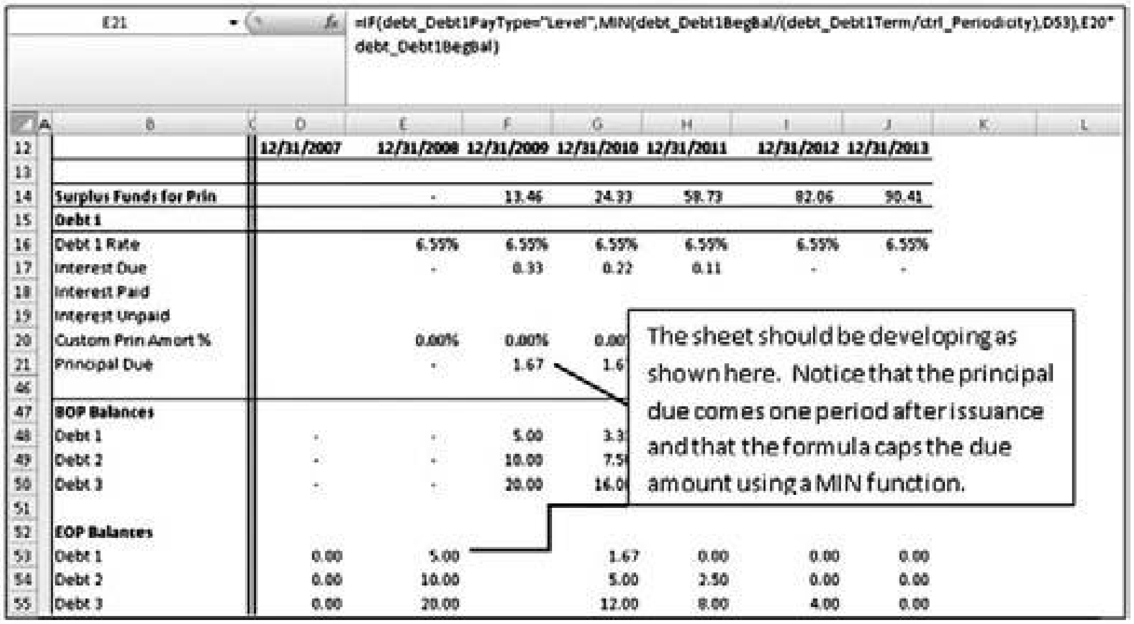


FIGURE 6.9 The principal due is currently based on the user-selected amortization methods and is capped by the prior period's balance.

Also, if you are unfamiliar with the MIN function, refer to the Toolbox at the end of this chapter. For a graphical depiction, refer to Figure 6.9.

The outer part of the formula is the IF function. If the IF function that tests whether the principal payment type is set to level principal method is FALSE, then a bullet percentage method is implemented. This is done by multiplying the user-entered percentage (cell E20) by the original balance of the loan (debt_Debt1BegBal). A MIN function is still necessary here because the debt schedule could go off schedule due to prepayments.

21. An additional feature we will add to this function is to turn off principal calculations when the debt is reduced to a very small level. When principal is prepaid, it sometimes throws debt off by very small decimal amounts. If these small balances persist, then there could be issues in later projection periods. As a check against this we can implement a precision factor to zero out calculations. Essentially, a precision factor allows us to tell the model to stop calculating when a value is reduced to a very, very small amount. Rather than hard coding this feature into formulas, we will create a precision level on the Assumptions sheet and use it throughout the model. Go to the Assumptions sheet and enter the text **Precision Level** in cell B12. Enter the value **.0001** in cell D12 and name that cell **inputs_Precision**. Now, go back to the Debt sheet and modify the formula in cell E21 to reflect the following:

=IF(D53<inputs_Precision,0,IF(debt_Debt1PayType="Level",MIN(debt_Debt1BegBal/(debt_Debt1Term/ctrl_Periodicity),D53),min(E20*debt_Debt1BegBal,D53)))

This addition to the formula checks the prior period's end-of-period balance to see whether it is less than the precision factor, which is nearly zero. If the balance is that low, then the principal payment is assumed to be 0. This protects against situations where there are thousandths of a penny in balance that could perpetuate a payment unnecessarily. The precision factor can be changed on the Assumptions sheet to a value that the model user is comfortable with or to a level that an auditor requires.

At this point, you can copy and paste the formula in cell E21 over the range E21:J21 with the understanding that this formula will change later. For this section, hold off completing the principal due for Debt 2 and Debt 3. There are minor changes between the tranche formulas that will be discussed later in this chapter.

PAYING LIABILITIES

So far we have calculated what is due for the long-term debt interest and principal. The more complicated step is determining how much can be paid, depending on the corporation's cash flows. This seems relatively simple in theory: If there is enough cash to pay the liability, pay the liability; otherwise, pay what is possible with the cash flow. We will see in Model Builder 6.2 that this theory is not too difficult to initially implement, but when we introduce the possibility of varying payment priorities, it becomes complex.

Getting the Correct Order

The ordering of liability payments within a company is extremely important. Altering payment priority can completely change the risk profile and investment-worthiness of a lending decision. The most standard form of payment priority is *sequential*, where each liability is paid in order or seniority. The most senior liability gets paid first, the immediate junior liability gets paid next, and so on. This process continues until everyone is paid or until there is no more cash and certain creditors receive partial payments or no funds at all. Within this process junior creditors should get paid a higher interest rate than creditors more senior to themselves. This is proper risk pricing since the more junior a creditor is the more risk of default exists. Refer to Figure 6.10 for a graphical representation of this concept.

A common alternative to sequential payment priority is pro rata or pari passu priority. A pro rata payment priority is typical for syndicated or bilateral funding, where two or more parties have the same priority of payment. However, if there is a shortfall or prepayment, how should the funds be divided? The division of loss or excess is done on a pro rata or proportional basis. In many cases, the proportion is based on the liability principal balance. This can be detected when reading loan documents and coming across wording such as: "The payment should be made *concurrently* on a *pro rata basis* based on. . . ." An alternative to using principal balance as the basis for the pro rata division is the terminology "based on each

Sequential Priority Characteristics						
Senior Debt	↑	Higher Payment Priority	↓	Lower Risk	↓	Lower Yield
Subordinate Debt	↓	Lower Payment Priority	↑	Higher Risk	↑	Higher Yield

FIGURE 6.10 There are common risk and reward trade-offs to sequential debt structures.

liability's due amount." In the case of interest payments, this would suggest that the pro rata proportion is based on interest due amounts.

To understand the effects of payment priority, we will go through an example of paying liabilities using a sequential payment structure, a pro rata payment structure based on principal balance, and a pro rata payment structure based on interest due. Let us assume we have two loans with the following characteristics:

Loan 1 Principal Balance: $500
Loan 1 Interest Rate: 8%
Loan 2 Principal Balance: $250
Loan 2 Interest Rate: 10%

The interest payments due for the first period would be $40 for Loan 1 and $25 for Loan 2. Assume that we had $75 to pay our liabilities. In such a case, both loans are able to receive their full interest payment since the combined liabilities are $65. However, now assume a stress scenario and that the cash available is reduced to $50. Under a sequential payment priority where Loan 1 is senior to Loan 2, Loan 1 would receive its full $40 of interest, while Loan 2 would receive only $10 of the $25 due. Loan 2 would bear the full brunt of the $15 shortfall in debt service. As the first loss lender, Loan 2 is riskier, which is why it is getting paid a higher interest rate. These calculations are shown in Figure 6.11.

Let's suspend reality for a minute and hold all assumptions the same, but change the payment priority to pro rata based on loan balance. The reason I suggest we are suspending reality is that the interest rates most likely would be more in line with each other in a pro rata situation, although in certain bilateral negotiations each lender's rates may be unknown to the other. Regardless, under a pro rata situation where the first loan represents 67% of the combined principal outstanding and the second loan is the other 33%, a sharing of the loss in the $50 cash flow case would take place. Loan 1 would be paid only $33 ($50 * 67%), while Loan 2 would be paid $17 ($50 * 33%). Notice in this situation the $15 shortfall is allocated on a pro rata basis between the two loans. These calculations are shown in Figure 6.12.

Sequential Methodology		
Loan 1	$	500
Loan 1		8.00%
Loan 2	$	250
Loan 2		10.00%
Cash Available	$	50
Loan 1 Interest Due:	$	40
Loan 1 Interest Paid:	$	40
Loan 2 Interest Due:	$	25
Loan 2 Interest Paid:	$	10

FIGURE 6.11 A sequential pay structure will show loss at the subordinate level first.

We can now try a third method of payment priority: pro rata using the interest due amounts as the proportion. Under this situation, Loan 1 has a proportional share of 62% ($40 interest due out of $65 of total interest due), whereas Loan 2 has a share of 38% ($25 interest due out of $65 of total interest due). Using the same example we have used for the previous two payment priority methodologies, under this payment priority Loan 1 would be paid $31, whereas Loan 2 receives

Pro Rata Methodology Using Principal for Proportional Calculation				
Loan 1	$	500	Proportional Share	66.67%
Loan 1		8.00%	(based on balance)	
Loan 2	$	250	Proportional Share	33.33%
Loan 2		10.00%	(based on balance)	
Cash Available	$	50		
Loan 1 Interest Due:	$	40		
Loan 1 Interest Paid:	$	33		
Loan 2 Interest Due:	$	25		
Loan 2 Interest Paid:	$	17		

FIGURE 6.12 A pro rata pay structure shares loss depending on the proportional share calculation.

Pro Rata Methodology Using Int Due for Proportional Calculation					
Loan 1	$	500			
Loan 1		8.00%			
Loan 2	$	250			
Loan 2		10.00%			
Cash Available	$	50			
Loan 1 Interest Due:	$	40	Proportional Share		61.54%
Loan 1 Interest Paid:	$	31	(based on int due)		
Loan 2 Interest Due:	$	25	Proportional Share		38.46%
Loan 2 Interest Paid:	$	19	(based on int due)		

FIGURE 6.13 Depending on the proportional share calculation the sharing of loss can be different.

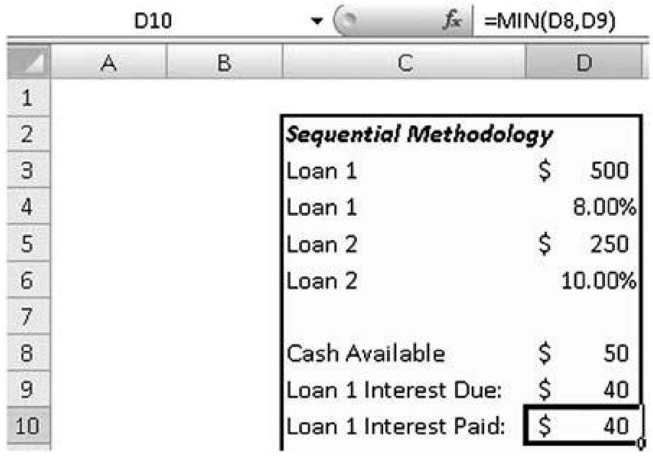
$19. Simply by changing the payment priority methodology we can alter the cash flow that each lender receives. Figure 6.13 summarizes these calculations.

Mechanics of Calculating the Correct Amount

Once we know how much should be directed to each party, we should make sure to institute a method that ensures the correct amount is actually paid each period. Calculations done by hand are fine with the standalone examples in the previous section, but we need to implement a system of logic that will return the correct amount to be paid each period. This can be done with the following statement: "Pay the lesser of what is available and what is due."

This statement can be applied to most examples, although determining what is available and what is due can occasionally get very complicated. As an example, let's use Loan 1's interest due amount of $40 above. If we had $50 available to pay the $40 interest due, then we would pay the lesser of $50 and $40, which is $40. If we had $30 available to pay the $40 interest due, then we would pay the lesser of $30 and $40, which is $30. Any way we work it, with this situation we will either pay the due amount, or, in a shortfall situation, all of the money available. Figure 6.14 shows how this calculation is set up (we will explain this calculation further in the next Model Builder).

An issue that we should discuss is the money that is available. In a corporation, what funds are available to pay debt service? This is an interesting question for financial modelers since we want to set up our model to draw upon the correct funds at the correct time. In the case of interest due to borrowers, we should recall


D10 =MIN(D8,D9)

	A	B	C	D
1				
2			***Sequential Methodology***	
3			Loan 1	$ 500
4			Loan 1	8.00%
5			Loan 2	$ 250
6			Loan 2	10.00%
7				
8			Cash Available	$ 50
9			Loan 1 Interest Due:	$ 40
10			Loan 1 Interest Paid:	$ 40

FIGURE 6.14 This calculation shows how to implement the theory of paying the lesser of what is available and what is due.

from most accounting methodologies that any amounts of interest paid are tax deductible, while principal is not. This suggests that the funds to pay interest come from a source pretax. If we work backward through the income statement, we have *net income*, *taxes paid*, *earnings before tax*, and then *interest expense/income*. Right before interest expense/income the funds available to the firm are *earnings before interest and taxes* (EBIT).

Careful readers may say, “But prior to EBIT there could be non-cash items removed such as depreciation and amortization. Also, there could be cash on hand. Aren’t there really more funds available?” Those readers are correct. There is more cash available if you add back the non-cash items and the cash on hand that period, but this could be an aggressive assumption depending on perspective. Lenders may think using earnings before interest, taxes, depreciation and amortization (EBITDA) is aggressive, particularly with capital-intensive companies, since the depreciation and amortization amounts will have to be replaced to keep the business in operation. From a short-term point of view, the difference between EBTIDA and EBIT is there in cash, but in the long term it is not viable to keep using that cash.

Similarly, if cash on hand is used to pay debt service, there could be anomalies in the figure that are only temporary. For instance, if a company sold off assets in one period and tried to use that amount as debt service coverage, it would be unsustainable unless it kept selling off assets at the same level. If this took place, it would probably impair the business from operating and reduce the ongoing cash flow to the firm that could be used for debt repayment. Also, if a minimal amount of cash is needed to run the company, the cash on hand may not be truly available for debt service. For our purposes, we will be conservative and use EBIT as the source of funds for interest debt service.

Principal is a different matter since it is paid after tax. This can get complicated since there are a number of items that may need to be paid after tax. Capital expenditure is perhaps the most important. Certain capital expenditures could be put on hold in times of distress, but that investment is typically necessary to keep a company running over time. Another major item after tax is equity payment or dividends. In times of distress or leading up to distress, dividends should be locked out and debt repaid. Just from these two we see that the person using the financial model must be careful where he draws his principal repayment funds from. In our case, we will calculate surplus cash after funding the company and use that amount to pay required amortization; if funds are still left over, then we will implement a cash sweep to prepay debt.

MODEL BUILDER 6.2: PAYING THE CORRECT LIABILITY AMOUNT

1. The first payment we will make will be the interest payments. We will start with easy formulas by implementing the simplest form of payment priority—sequential. Prior to entering formulas, we should take a moment to add some additional labels by entering the following text in the corresponding cells:

   B18, B28, B38: **Interest Paid**
   B19, B29, B39: **Interest Unpaid**
   B22, B32, B42: **Principal Paid**
   B23, B33, B43: **Principal Unpaid**

2. With labels complete, we can now start entering the first interest paid formula. Enter the following formula in cell E18 on the Debt sheet to create the interest payment for Debt 1:

   =MIN('Income Statement'!E17-'Income Statement'!E19+'Income Statement'!E25-'Income Statement'!E28,E17)

   Earlier we used the MIN function to prevent calculating too much principal to be due. In this case, we are using the MIN function to translate the statement "Pay the lesser of what is available and due" directly into an Excel function. Notice that the sources of the funds for the first interest payment are being calculated using EBIT, less nonoperating expenses, plus interest income, less short-term debt interest. At this point, we have not calculated the interest income or short-term debt interest, but will come back to those calculations in Chapter 7. The MIN function takes the lesser of those funds and the interest due. Copy and paste this formula over the range E18:J18.
3. We will now implement the same formula for Debt 2, but there will be a slight difference. Let's enter the following formula in cell E28 and then discuss the difference:

=MIN('Income Statement'!E17-'Income Statement'!E19+'Income Statement'!E25-'Income Statement'!E28-E18,E27)

The difference is that there is an additional item subtracted from what is available. Notice we subtract cell E18, which is Debt 1's interest paid amount. This is because we have implemented a sequential payment structure and funds that have been paid to Debt 1 are not available to Debt 2. Copy and paste this formula over the range E28:J28.

4. We should then enter the last interest paid formula in cell E38:

   =MIN('Income Statement'!E17-'Income Statement'!E19+'Income Statement'!E25-'Income Statement'!E28-E18-E28,E37)

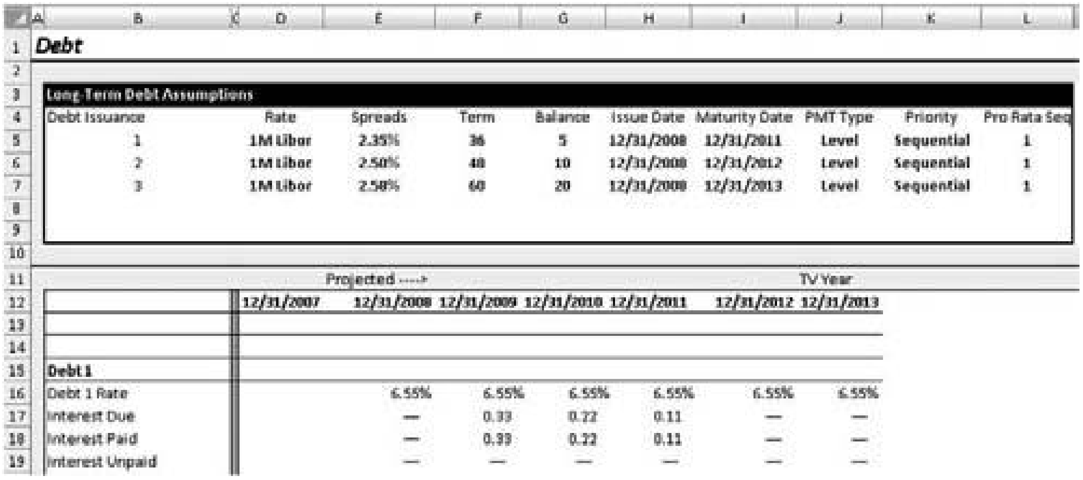
   Notice the pattern of subtracting out the senior debts' interest payments (Debt 1 and Debt 2). By calculating what can be paid in such a way we will never misplace cash and use it for other sources that should not have access. Models that do not subtract out senior debt payments from cash available to junior layers, whether intentional or not, are creating fictitious cash in the model.
5. If we know how much interest is due and how much can be paid, we should take a moment to calculate whether there is any unpaid interest. This calculation is just interest due minus interest paid. Enter the following formula in cell E19, still on the Debt sheet:

   =E17-E18

   Copy and paste this formula over the range E19:J19. This amount is very useful for creating internal validations to quickly see whether any interest payment is missed and also for capitalizing unpaid interest. Recall that we referenced row 19 in row 53, the balance calculation, so that any unpaid interest was added to that period's balance. This is the full interest capitalization implementation. The model should be developing as seen in Figure 6.15.
6. We should also remember to enter the unpaid interest formulas for Debt 2 and Debt 3. Enter the following formulas in the corresponding cell references:

   E29: **=E27-E28**
   E39: **=E37-E38**

   Copy and paste these formulas to column J in their respective rows.
7. The remaining steps are focused on principal payments and can get very complicated, so it is important to pay close attention to the growth and final outcome of formulas. The first step we need to do for principal is creating a space for the funds available to pay the principal. Since we have yet to finish the balance sheet we do not know how much surplus funds there are to pay the principal. We will label and put proxy values in for now until we complete the surplus funds



Debt

Long-Term Debt Assumptions									
Debt Issuance	Rate	Spreads	Term	Balance	Issue Date	Maturity Date	PMT Type	Priority	Pro Rata Seq
1	1M Libor	2.35%	36	5	12/31/2008	12/31/2011	Level	Sequential	1
2	1M Libor	2.50%	48	10	12/31/2008	12/31/2012	Level	Sequential	1
3	1M Libor	2.58%	60	20	12/31/2008	12/31/2013	Level	Sequential	1

		Projected ---->				TV Year	
	12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
Debt 1							
Debt 1 Rate		6.55%	6.55%	6.55%	6.55%	6.55%	6.55%
Interest Due		—	0.33	0.22	0.11	—	—
Interest Paid		—	0.33	0.22	0.11	—	—
Interest Unpaid		—	—	—	—	—	—

FIGURE 6.15 Thus far we have covered enough to set up debt and make interest payments. Note that your version will have different figures until principal amortization is implemented.

field in Chapter 7. On the Debt sheet, enter the following text in the corresponding cell:

B14: **Surplus Funds for Prin**

Also in each cell within the range E14:J14 enter a value of **100**. This will be a proxy value until we complete the surplus funds calculation.

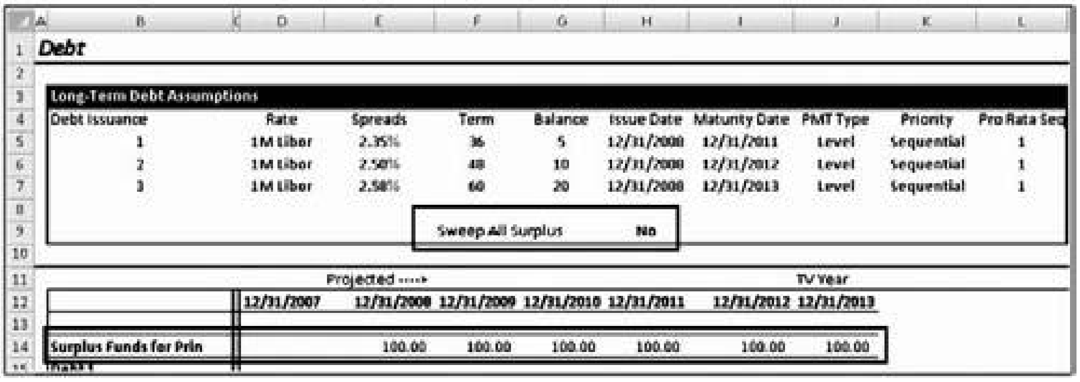
8. Now we have two primary formulas to complete: principal due and principal paid. We never completely finished the principal due formula in Model Builder 6.1 because when a cash sweep is implemented we need to understand payment priorities for the distribution of excess cash. Now that we know more about payment priorities we can complete the formula.

   The first formula to focus on is principal due. The challenge with principal due is that when there is surplus cash, it is often used to accelerate the pay down of long-term debt. This may or may not be the case, so we need to implement an option for the user to allow all of the surplus cash to be due for principal prepayment. To do this, we need to create a few administrative items.

   On the Debt sheet, in cell F9, enter the text **Sweep All Surplus**. Cell H9 will contain a Yes/No selection, which we will create as a data validation list. Go to the Hidden sheet and enter the following text in the corresponding cells:

   D12: **lst_YesNo**
   D13: **Yes**
   D14: **No**

   Name the range D13:D14 **lst_YesNo**. Go back to the Debt sheet and in cell H9 create a data validation list using the named range lst_YesNo as the source.



Debt

Long-Term Debt Assumptions									
Debt Issuance	Rate	Spreads	Term	Balance	Issue Date	Maturity Date	PMT Type	Priority	Pro Rata Seq
1	1M Libor	2.35%	36	5	12/31/2008	12/31/2011	Level	Sequential	1
2	1M Libor	2.50%	48	10	12/31/2008	12/31/2012	Level	Sequential	1
3	1M Libor	2.58%	60	20	12/31/2008	12/31/2013	Level	Sequential	1
				Sweep All Surplus	No				

		Projected ---->					TV Year
	12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
Surplus Funds for Prin		100.00	100.00	100.00	100.00	100.00	100.00

FIGURE 6.16 The cash sweep and surplus funds available for principal payment are added to the sheet.

Name cell H9 **debt_CashSweepOn**. When debt_CashSweepOn is set to Yes, we will take all of the surplus cash and use that to pay down debt. This means that the principal due formula will draw from the entire surplus in each period of row 14 on the Debt sheet. For now, keep the cash sweep off by selecting **No**. Keep in mind that right now we have proxy values in row 14, which will be altered in Chapter 7. The new features are highlighted in bold black boxes in Figure 6.16.

9. With the cash sweep option implemented we are primed to complete the principal due formula that we started in Model Builder 6.1. The complete formula will follow with a detailed explanation of each new addition, which is in bold in the formula. On the Debt sheet in cell E21, modify the existing formula so that it reads:

=IF(AND(debt_CashSweepOn="Yes",debt_Debt1Priority="Sequential"), MIN(E14,D53),IF(AND(debt_CashSweepOn="Yes",debt_Debt1Priority= "Pro Rata"),MIN(E14*E60,D53),IF(D53<inputs_Precision,0,IF(debt_Debt1 PayType="Level",MIN(debt_Debt1BegBal/(debt_Debt1Term/ctrl_ Periodicity),D53),E20*debt_Debt1BegBal))))

This is clearly one of the most complex formulas in the model. There are multiple nested IF, AND, and MIN functions. Also there is a reference to a pro rata section that we have not completed yet, so if pro rata is selected as the payment priority method for this loan this formula will return an error. Let's begin from the very beginning of the formula and work through each IF function. The first IF function immediately uses an AND function in order to evaluate two conditions. The first condition is whether the cash sweep is activated; the second condition is whether the payment priority is set to sequential or pro rata. If the cash sweep is on and the payment priority is set to sequential, then the minimum of the surplus funds (cell E14) and the prior period's end-of-period balance (cell E53) is returned. In a sequential payment priority structure with a cash sweep activated, any remaining surplus cash will first be due to the most senior debt

(Debt 1). Notice that we cap this amount with the MIN function since we would not calculate principal due higher than the balance of the debt.

If the first IF function is false, then another test is set with a nested IF function. The next IF is similarly structured, but instead of testing for the cash sweep activation with a sequential payment priority method, it tests for the cash sweep activation with a pro rata payment priority. If a pro rata payment priority methodology is implemented, we need to multiply the surplus available by the proportional share allocated to Debt 1. Recall that earlier in this chapter we saw we could calculate this proportional amount using principal balances or interest due amounts. Since debt balances and interest due amounts can change each period we need to track this figure each period. In our example model we will set up pro rata proportional shares based on debt balance. This will be done in Model Builder step 10. For now, we can reference where we will do that calculation (cell E60). If we constrain the surplus available by the proportional share, we are correctly calculating the amount available. We must still worry about exceeding the principal balance of the debt, so we use a MIN function.

Finally, if the cash sweep is not activated, then our principal due amount is the previously explained calculation that is dependent on whether a level or bullet payment methodology is selected. Copy and paste the formula over the range E21:J21.

10. A critical element that is incomplete in the last formula is the reference to cell E60, where the pro rata proportional share is calculated. The formula that we will enter in cell E60 will be a special type of formula known as an *array* formula. This is an intermediate-to-advanced use of Excel and is explained in more detail in the Toolbox later in this chapter. Let's learn about this formula by entering the following formula on the Debt sheet in cell E60:

    =IF(E48<=inputs_Precision,0,E48/(SUM(IF(debt_Debt1PRSeq=$L$5:$L$7, E$48:E$50,0))))

    You will immediately notice that this will cause an error. This is because the formula is an array formula and references multiple cells at a time. In order to tell Excel that we are entering an array formula we must hold down **CTRL-SHFT** and then press **ENTER** to correctly enter an array formula. This will cause the curly braces to appear as seen here:

    {=IF(E48<=inputs_Precision,0,E48/(SUM(IF(debt_Debt1PRSeq=$L$5:$L$7, E$48:E$50,0))))}

    The formula first checks the balance of Debt 1 at the beginning of the period. If it is less than the precision level, then the debt is paid off and there should be no proportional share to Debt 1. However, if Debt 1 has a balance, we need to compare that to the other debt balances in order to determine the proportional share due to Debt 1. Although this may seem like a simple division of

E60 | {=IF(E48<=inputs_Precision,0,E48/(SUM(IF(debt_Debt1PRSeq=$L$5:$L$7,E$48:E$50,0))))}

	A	B	C	D	E	F	G	H	I	J	K
59		**Pro Rata Shares (Balances)**									
60					0.00%	14.29%	12.42%	8.93%	0.00%	0.00%	
61					0.00%	28.57%	27.95%	26.79%	23.81%	0.00%	
62					0.00%	57.14%	59.63%	64.29%	76.19%	100.00%	

FIGURE 6.17 The pro rata share percentages are critical to calculating the correct pro rata amounts.

Debt 1's balance by the total debt balances at the beginning of the period, there is a chance that all of the debt is not pro rata. Figure 6.17 shows this new addition.

This is where debt structures can get very complicated. We could have Debt 1 being a senior debt issuance and Debt 2 and Debt 3 as pro rata subordinate issuances. This would mean Debt 1 would have priority over cash flow, but Debt 2 and Debt 3 are pari passu and must share anything left over. Similarly, Debt 1 and Debt 2 could theoretically be pari passu and share the first amounts, while Debt 3 is sequential and must take subordinate cash flows. To overcome this problem it is best to implement a pro rata sequencer.

We create the basic pro rata sequencer in range L5:L7 on the Debt sheet. It is currently set to all 1's as a proxy. Keep in mind that the pro rata sequencer does nothing when a sequential payment priority method is set (which should be the current default state of the model). When we activate pro rata payment priority, we need to establish which debt is pro rata with the others. If all of the values in the pro rata sequencer are set to 1, then all of the debts are pro rata with each other. However, if the first loan is a senior and takes sequential priority over two pari passu issues, then the pro rata sequencer should be set to 1,2,2, indicating the first tranche is senior to two pari passu tranches. The default setting of 1,1,1 is entered in the example model and shown in Figure 6.18.

The actual assumption entry in range L5:L7 has little functionality. It is the conditional sum we created in the following part of the formula entered in cell E60:

SUM(IF(debt_Debt1PRSeq=$L$5:$L$7,E$48:E$50,0)))

This section of the formula sums results returned by an IF function that evaluates Debt 1's pro rata sequence (debt_Debt1PRSeq) against all of the pro rata sequences. It will at least be equal to itself, so at minimum the denominator will include the balance of Debt 1, which will produce 100% as the denominator to its own balance as a numerator. However, if other debt issuances share priority with Debt 1, then those balances will be returned by the IF function and then summed by the SUM formula. Copy and paste the formula in cell E60 over the range E60:J62. We should also label this section **Pro Rata Shares (Balances)** by entering that text in cell B59.

FIGURE 6.18 The pro rata sequencer is used to tell the formulas which loan issuances are pro rata with each other.

11. We can now complete the principal paid section. Enter the following formula in cell E22 on the Debt sheet:

    =IF(debt_Debt1Priority="Sequential",MIN(E14,E21),MIN(E14*E60,E21))

    If the payment priority is sequential, then the formula takes the lesser of what is available (cell E14) and what is due (cell E21). Otherwise, a pro rata payment priority is assumed, where the proportional share in cell E60 is multiplied to the surplus funds in order to determine how much cash is available for debt service. This amount is capped by the principal due calculation, using a MIN function. Copy and paste this formula over the range E22:J22.
12. Similar to interest, we should track whether there is unpaid principal. Go to cell E23 and enter the following formula:

    =E21-E22

    Copy and paste this formula over the range E23:J23. This completes Debt 1's principal calculations. We will next replicate the calculations for Debt 2 to show the similarities and differences when working with more than one issuance of debt.
13. The complete formula for Debt 2's principal due amount should be entered as follows in E31 on the Debt sheet:

    =IF(AND(debt_CashSweepOn="Yes",debt_Debt2Priority="Sequential"), MIN(E14-E22,D54),IF(AND(debt_CashSweepOn="Yes",debt_Debt 2Priority="Pro Rata"),MIN(E14*E61,D54),IF(D54<inputs_Precision,0,

IF(debt_Debt2PayType="Level",MIN(debt_Debt2BegBal/(debt_Debt2Term/ ctrl_Periodicity),D54),E30*debt_Debt2BegBal))))

This formula is nearly identical to Debt 1's except for the following key differences:

- Any assumption that used the naming "Debt1," such as debt_Debt1Priority, is switched to Debt2, as in debt_Debt2Priority.
- Sequential calculations must remove Debt 1's principal payment. For example, the MIN function that calculates the principal due amount subtracts cell E22, which is Debt 1's principal paid amount.
- All references to Debt 1 information such as balances and pro rata share percentages must be changed to Debt 2.

Copy and paste the formula over the range E31:J31.

14. For principal paid, the differences are the same, but for the formula in cell E32:

    =IF(debt_Debt2Priority="Sequential",MIN (E14-E22,E31),MIN(E14*E61,E31))

    We can see that the primary differences are the references for Debt 2 and the subtraction of any principal paid to Debt 1. Copy and paste this formula over the range E32:J32.
15. Complete the process for Debt 2's principal unpaid and the pro rata share percentages. Be careful when dragging some references since there are many uses of named ranges that are specific to each debt issuance. These may require changing the formula's references by hand.
16. Once Debt 2 is complete, do the same for Debt 3, making sure to take into account the principal payments for Debt 1 *and* Debt 2. Also change all references so they refer to Debt 3 assumptions and calculations.
17. A figure that will help us understand cash flow is how much money remains after principal is repaid. In cell B45 on the Debt sheet, enter the text **Surplus Funds Post Prin**. In cell E45, enter the following formula:

    =E14-E22-E32-E42

    Copy and paste this formula over the range E45:J45. The debt section for Debt 1 should now look like Figure 6.19.

Limitations on the Implemented System

The system that is set up in the example model is robust, but definitely has room for modification and expansion to adapt to analysis needs. The following limitations and suggestions for expansion should be noted:

1. To keep the initial stages of the Model Builder exercises easier the interest calculations were done using only a sequential payment priority. If a true pro

	B	D	E	F	G	H	I	J
11			Projected ---->					TV Year
12		12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
13								
14	**Surplus Funds for Prin**		100.00	100.00	100.00	100.00	100.00	100.00
15	**Debt 1**							
16	Debt 1 Rate		6.55%	6.55%	6.55%	6.55%	6.55%	6.55%
17	Interest Due		-	0.33	0.22	0.11	-	-
18	Interest Paid		-	0.33	0.22	0.11	-	-
19	Interest Unpaid		-	-	-	-	-	-
20	Custom Prin Amort %		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
21	Principal Due		-	1.67	1.67	1.67	-	-
22	Principal Paid		-	1.67	1.67	1.67	-	-
23	Principal Unpaid		-	-	-	-	-	-

FIGURE 6.19 The debt section is nearly complete with principal payments now being calculated.

rata payment system were introduced, it would more likely be the case that interest payments were also set up in a pro rata fashion. This can be easily implemented in the example model by examining the pro rata option formulas for principal paid and applying them to the interest paid section. An additional pro rata sequencer and percentage share section can be incorporated for the interest. Also keep in mind that even if there is a switch to pro rata, there should still be priority of the interest payments over the principal payments. Most likely the interest will be paid prior to tax, whereas the principal is paid using after-tax, remaining funds.

2. There can be rare instances in a pro rata situation when the formulas that were implemented in Model Builder 6.2 will break down. The formulas in that section assume that if there are pro rata issuances of debt, they will have very similar characteristics in regard to payments. If there are significant differences between payment terms for pro rata issuances of debt, there might be a need to modify the formulas. For example, take two loans that are pari passu to each other as an example. If one of the loans had a custom amortization schedule where a principal payment was not due in a given year and the other had a payment due, there could be problems if there were a shortfall of cash in that year. Let's say Loan 1 has a pro rata share percentage of 70%, whereas Loan 2 has a pro rata share percentage of 30%. Further assume Loan 1 has a custom amortization schedule where there is no principal payment due in the current period; however, Loan 2 has a principal payment due of $50. The final assumption to assume is that the cash available for Loan 2 is $100. Our formula in this case would calculate the principal paid at $30 for Loan 2 for the current period. This would mean there would be $20 of unpaid principal, which would theoretically be retained or released to equity. No debt holder would stand for such an arrangement! The formula would have to be modified, most likely using an IF function, to see whether there is another payment due and adjust the payment appropriately.

3. A similar problem with the pro rata calculation can occur if there is a large mismatch between balances and principal payments due. This could lead to paying less principal for a loan than required, even when there are funds available. The modifications for this are similar to point 2, where an IF function would ensure payment in odd circumstances.
4. Currently, the user must enter any sequential loans in order from top to bottom on the Debt sheet. This will work fine as long as the users know that this must be done and that if pro rata loans enter into the capital structure they must use the pro rata sequencer in an ordinal matter (e.g., 1,2,2 is the correct order for two pro rata loans subordinate to a senior loan, not 2,2,1).
5. Payments are assumed to take place on the dates in the forecast period. Interest is assumed to be charged over the course of the full payment period, whereas principal payments come in on that same period. If, say, an annual system is set up, but quarterly principal payments are being made, a model user might want to average out the balance since the interest due will be less than in a pure annual payment scheme. Overall, this is not preferred since the model should be set to a periodicity that is in line with the debt payments.
6. Using both sequential and pro rata payment methodologies in the same scenario (e.g., 1,2,2) with the cash sweep activated requires a modification of the example model formulas. This is because the example formula does not subtract out the sequential cash flow from the cash available. Creating this functionality is quite complicated as you must set up an array formula to reference the correct sequential issuance and use that as an indicator to determine the principal paid that should be subtracted.

MODEL BUILDER 6.3: INTEGRATING LONG-TERM DEBT INTO THE INCOME STATEMENT AND BALANCE SHEET

1. There are a few more steps to complete the long-term debt section of the model. First we should jump to the Income Statement sheet where interest expense is removed from net income. Enter the text **Interest Expense** in cell B27 on the Income Statement sheet and then enter the following references for labels:

   B29: **=Debt!B15**
   B30: **=Debt!B25**
   B31: **=Debt!B35**

2. Since all of the calculations are already done for us, we need only to reference the interest amounts from the Debt sheet. Note that we are referencing the interest due component of each debt issuance. This is because if we were to get very technical with the model and develop it more, we would have the interest due be the interest expense for the period and any unpaid amounts accruing

in an accrued interest account. Given the target level of the model, we will just reference the interest due section of the balance sheet. Enter the following references in the corresponding cells:

E29: **=Debt!E17**
E30: **=Debt!E27**
E31: **=Debt!E37**

Copy and paste these formulas from column E to column J while maintaining the same row. For example, cell E29 should be copied and pasted over range E29:J26, and cell E30 over range E30:J30. Be careful not to just drag cell E29 down and across since it will not reference the correct rows.

3. Enter the text **Total Interest Expense** in cell B32. Then enter the following formula in cell E32:

   =SUM(E28:E31)

   Copy and paste this formula over the range E32:J32. Note that this SUM function captures row 28, which will be completed in Chapter 7. Also keep in mind that in Chapter 3 we entered the formula for EBT, which subtracts row 32 from EBIT. This section is directly how interest expense impacts earnings. Figure 6.20 shows these additions to the Income Statement sheet (keep in mind your figures are most likely different from the figure for total interest expense since we have yet to explain short-term debt, which is part of this calculation).
4. On the Balance Sheet sheet, we need to update the liability section to include the long-term debt calculations. Enter the following formula in cell E35 on the Balance Sheet sheet:

   =Debt!E53+Debt!E54+Debt!E55

   Copy and paste this formula over the range E35:J35. This new section to the Balance Sheet sheet is shown in Figure 6.21.

	B	C	D	E	F	G	H	I	J
27	Interest Expense								
28	ST Debt			0.53	0.53	-	-	-	-
29	Debt 1			-	0.33	0.22	0.11	-	-
30	Debt 2			-	0.67	0.50	0.34	0.17	-
31	Debt 3			-	1.36	1.08	0.81	0.54	0.27
32	Total Interest Expense			0.53	2.89	1.80	1.26	0.71	0.27
33	EBT		85.20	109.64	105.26	119.17	134.16	160.28	185.72

FIGURE 6.20 The long-term debt interest is an expense taken out of net income, prior to tax.

	B	C	D	E	F	G	H	I	J
35	LT Borrowings		0.00	35.00	26.83	18.67	10.50	4.00	0.00
36	Total Liabilities		18.00	79.10	52.8	47.5	42.5	39.5	37.9

FIGURE 6.21 The debt balances from the Debt sheet are long-term liabilities on the balance sheet.

TOOLBOX

MIN, MAX

The MIN function on its own is very simple; it stands for the word *minimum* and takes the least-valued number out of the entered range of numbers. The entry parameters for MIN are:

MIN(value 1, value 2, value 3 . . .)

As you can see, it will return the value that is smaller than all of the other values. For finance, MIN can be thought of as a *cap creator*. For instance, if you have a 6.0% interest rate cap and the current market rate is 7.0% and you created a formula with MIN(interest rate cap, market rate), the interest rate cap would be returned. If the market rate went below the interest rate cap, then the market rate would be returned.

The opposite of taking a minimum is taking a *maximum*. The function for that is MAX. Essentially, MAX does the opposite of MIN, even in respect to finance theory. MAX can be thought of as a *floor creator*.

AND, OR

AND and OR functions are logical functions. That statement seems to underscore the difficulty in working with these functions since they can be confusing. An AND function evaluates up to 255 separate conditional tests and returns a TRUE if all of the tests are TRUE. If one or more tests are FALSE, then a FALSE is returned. The entry parameters for AND include:

AND(conditional test 1, conditional test 2, conditional test 3 . . .)

To demonstrate this in an example, imagine we had a row with "Yes" or "No" denoting whether a reserve account was active and a row with periodic dates. Now, for each period, suppose we wanted to return a TRUE if the reserve account was active and the projection date was greater than an assumption date. Looking at the setup in Figure 6.22, we could use AND by writing:

AND(D3="Yes",D2>$A$3)

	A	B	C	D	E	F	G
1							
2			Date	9/1/2009	10/1/2009	11/1/2009	12/1/2009
3	10/1/2009		Reserve Active	Yes	No	Yes	Yes
4				FALSE	FALSE	TRUE	TRUE

FIGURE 6.22 The AND function evaluates both the Yes/No and the date to return a TRUE or FALSE depending on whether BOTH conditions are TRUE.

A variation on this is if we were concerned about only one of the conditions being TRUE. In that case, we would use an OR function. An OR function returns a TRUE if just one conditional test is TRUE. A FALSE is returned when all conditional tests are FALSE. The entry parameters for OR are identical to AND:

OR(conditional test 1, conditional test 2, conditional test 3 . . .)

We can modify the example above by switching the AND to an OR. Notice the difference in the resulting TRUE and FALSE returns by instituting the change. This difference is shown in Figure 6.23.

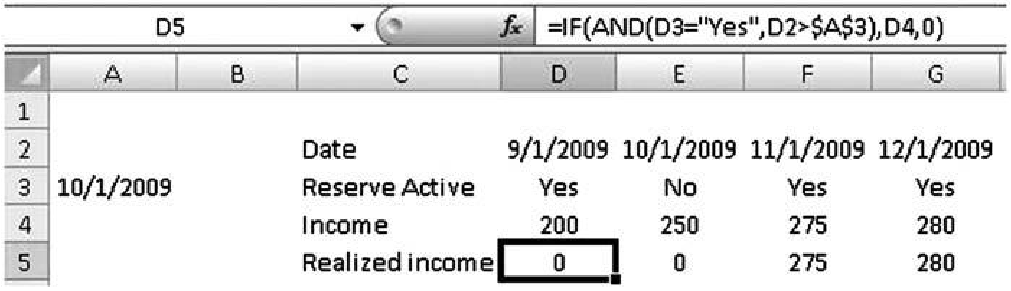
One particular challenge financial modelers have is working with AND and OR functions effectively. On their own they are relatively simple functions, but how do we extract the full value from them? This is done by using AND and OR with IF functions. An IF function evaluates a reference for a TRUE or FALSE value and then returns different results depending on whether TRUE or FALSE was the result of the original evaluation. Since AND and OR functions return a TRUE or FALSE, we can use them in combination with IF functions.

Working with our prior example, let's add a row for income. In the first case we will want to have the income returned if the reserve account is active and if the current date is past a certain assumption date. We can use the combination of an IF and AND function as seen in Figure 6.24.

D4 fx =OR(D3="Yes",D2>$A$3)

	A	B	C	D	E	F	G
1							
2			Date	9/1/2009	10/1/2009	11/1/2009	12/1/2009
3	10/1/2009		Reserve Active	Yes	No	Yes	Yes
4				TRUE	FALSE	TRUE	TRUE

FIGURE 6.23 Changing the AND to an OR produces different TRUE or FALSE returns because with an OR function only one condition of the two must be met.



D5 =IF(AND(D3="Yes",D2>$A$3),D4,0)

	A	B	C	D	E	F	G
1							
2			Date	9/1/2009	10/1/2009	11/1/2009	12/1/2009
3	10/1/2009		Reserve Active	Yes	No	Yes	Yes
4			Income	200	250	275	280
5			Realized income	0	0	275	280

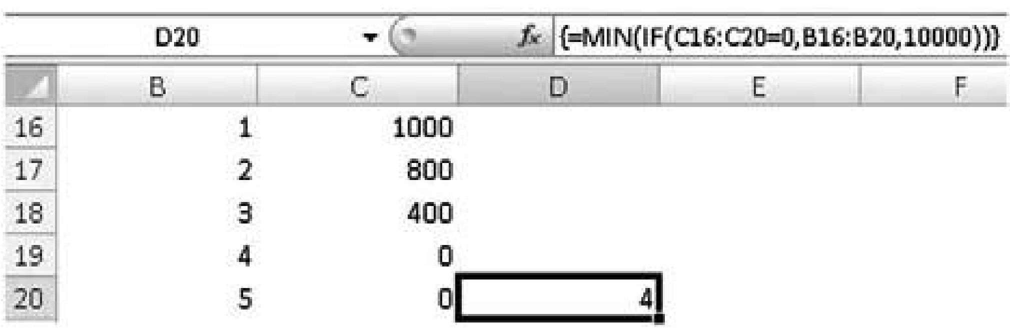
FIGURE 6.24 Using an IF function with AND or OR allows multiple conditional tests to be evaluated and meaningful results returned.

Array Functions

Array functions are a powerful way to use Excel. An *array* is a series of data. For our purposes, we must realize that it is *any set of data greater than one cell*. This can be in column, row, or matrix form. The term *function* refers to an Excel function. Combining these two words, we have the concept of an Excel function that works with arrays or multiple cells of data.

Readers might be confused because some functions work with arrays of data that do not seem very special, such as SUM, AVERAGE, MIN, and so on. Array functions are special types of Excel functions that differentiate themselves in one of two ways:

- They return multiple values using the exact same formula and are entered by first highlighting multiple cells and then entering a single formula. LINEST is an example of this as it returns 10 key statistical values based on a single formula reference.
- They are regular formulas that reference multiple cells without the use of an Excel function. For example, imagine we had a loan amortizing and wanted



D20 {=MIN(IF(C16:C20=0,B16:B20,10000))}

	B	C	D	E	F
16	1	1000			
17	2	800			
18	3	400			
19	4	0			
20	5	0	4		

FIGURE 6.25 In this formula, we use an IF function that returns the period if the balance is equal to zero, or a very large number if it is not. Then the MIN function returns the lowest of those values, which will be the period that the loan pays off.

to know the period that it paid off. We can use a mathematical formula that evaluates all of the cells where there is a balance. Since there are going to be multiple cells where the balance is zero, we want to examine each cell and then take the minimum period number of the ones that are zero. This formula is shown in Figure 6.25.

A key concept to keep in mind is that array functions must always be entered by holding down **CTRL-SHFT** and then pressing **ENTER**. This will create the curly braces around the function and inform Excel that an array function is being used.

7
Balancing the Model

We are now at a very interesting stage in the model-building process, where we need to tie together all of our seemingly independent calculations and produce a truly dynamic model. So far, we have had a few linkages between the Income Statement, Balance Sheet, Capex, Intangibles, and Debt sheets, but nothing really unifying all of them. In this chapter we will revisit the Income Statement and Balance Sheet sheets to connect any incomplete items, calculate a few skipped-over concepts, and ultimately balance the balance sheet.

The concept of balancing the model reverts back to the accounting theory discussed in Chapter 4. The most relevant principle from that chapter is that *assets must equal liabilities plus shareholders equity at all times*. In cases where our projections temporarily deviated from this principle, we identified surplus funds as the asset-side plug and short-term debt as the liability-side plug. Figure 7.1 reviews these concepts.

One challenge of implementing the plugs is that, aside from just being used to calculate the difference when our main accounting principle is unbalanced, the plugs contribute to the difference through interest expense and income. All forms of cash, including surplus funds, would most likely be kept in a highly liquid, safe investment such as guaranteed investment contracts or marketable securities. These investments will earn a small, but potentially useful amount of income. Similarly, short-term debt is not free and will require the company to pay interest. These interest amounts flow through the income statement and affect retained earnings. This change in equity further changes the balance sheet and sets up a circular problem.

Our process in this chapter will be to first set up the interest calculations for cash and short-term debt. Once that is done, we are ready to implement the balancing mechanism, which balances the balance sheet. After creating a dynamic, balanced model, we will try a few assumptions to make sure that the model makes sense, prior to proceeding further.

MODEL BUILDER 7.1: CALCULATING CASH AND SHORT-TERM DEBT INTEREST

1. The first step that will greatly assist our development of this section is putting proxy values in for surplus funds and short-term debt. This will prevent annoying

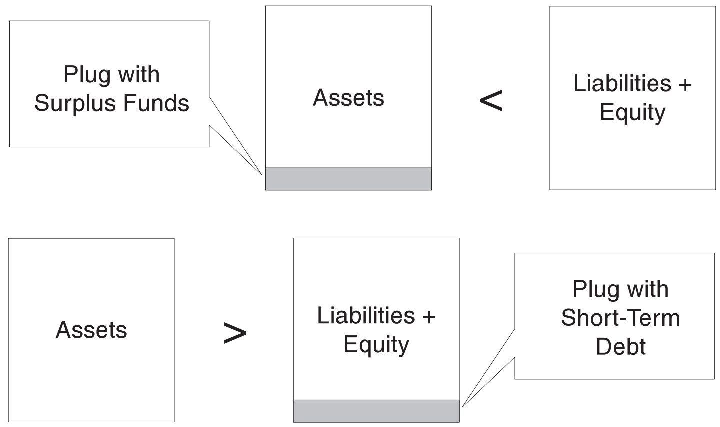


FIGURE 7.1 Plugs are used in projection models to adhere to the standard accounting principle of assets equaling liabilities plus equity.

#DIV/0! errors and make our formula creation visually easier. For now, put a value of **1** for each period for the Surplus Funds For Prin on the Debt sheet (range E14:J14). Also put values of **1** for each period for the ST borrowings section on the Balance Sheet sheet (range E31:J31). These temporary states of the model are shown in Figure 7.2.

2. We need to set up one reference on the Balance Sheet sheet before focusing on the Income Statement sheet. On the Balance Sheet sheet, enter the following formula in cell E6:

=Debt!E45

Copy and paste this formula over the range E6:J6.

From the Debt sheet

	A	B	C	D	E	F	G	H	I	J
11					Projected ---->					TV Year
12				12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
13										
14		Surplus Funds for Prin			1.00	1.00	1.00	1.00	1.00	1.00
15		Debt 1								

From the Balance Sheet sheet

	B	C	D	E	F	G	H	I	J
29	Liabilities								
30	Accounts Payable		15.00	17.57	18.67	20.78	23.13	25.74	27.75
31	ST Borrowings		0.00	19.92	0.00	0.00	0.00	0.00	0.00

FIGURE 7.2 To make it easier to implement new formulas, we should put proxy values in each period, for both plugs.

3. We need to set down the basic assumptions for cash and short-term debt interest. We are primarily concerned with the interest rate settings for each of these items. A secondary concern is the absolute amount of short-term debt that is being created. Go to the Assumptions sheet and enter the following text in the corresponding cells:

   B22: **Cash and Short-Term Debt Assumptions**
   B24: **Surplus Funds**
   B25: **Cash**
   B26: **Marketable Securities**
   B27: **Short-Term Funds**
   B28: **Short-Term Funds Limit**
   C23: **Rate**
   D23: **Spread**

4. Each of the interest-bearing items (Surplus Funds, Cash, Marketable Securities, and Short-Term Debt) will be assigned an index based on the indexes available on the Vectors sheet. Essentially, we are setting up the same rate-referencing system as we did for long-term debt. Create data validation lists in C24:C27 using the named range lst_InterestRates as the source. Set each one initially to **1M Libor**.
5. Enter a value of **0.125%** for each cell in range D24:D26. These will be the spreads or margins over the index rate that the cash items are earning. For short-term debt we will assume a higher spread. Enter the value **1.15%** in cell D27. Thus far, the new section on the Assumptions sheet should look like Figure 7.3.
6. Go to the Income Statement sheet and enter the following text in the corresponding cells to establish labels for the section we will work on:

   B21: **Interest Income**
   B22: **Surplus Funds**

	A	B	C	D
21				
22		**Cash and Short-Term Debt Assumptions**		
23			Rate	Spread
24		Surplus Funds	**1M Libor**	**0.125%**
25		Cash	**1M Libor**	**0.125%**
26		Marketable Sec.	**1M Libor**	**0.125%**
27		Short-Term Debt	**1M Libor**	**1.150%**
28		Short-Term Debt Limit		

FIGURE 7.3 The Assumptions sheet controls the cash and short-term debt's interest assumptions.

B23: **Cash**
B24: **Marketable Securities**
B25: **Total Interest Income**
B28: **ST Debt**

7. We will complete the interest income prior to the short-term debt. The first item to add is any historical interest income amounts. Because surplus funds is merely a projected figure, there should be no historical amounts for it. Enter the following values and formulas in the corresponding cells:

   D23: **.30**
   D24: **.20**
   D25: **=SUM(D19:D21)**

   Copy and paste the formula in cell D25 over the range D25:J25.
8. A challenge with implementing this section is that we will require balances in order to get figures to propagate in these cells. To set this up properly, the easiest method is to assume there are balances on the balance sheet and as we complete the balance section later the interest sections will be populated with values. To do this, enter the following formula in cell E22 on the Income Statement sheet:

   =AVERAGE('BalanceSheet'!D6:E6)*(OFFSET(Vectors!E$33,MATCH(inputs_SuplusFundsRate,lst_InterestRates,0),0)+inputs_SurplusFundsSpd)

   Let's break this lengthy formula apart in three separate pieces. The first piece is an AVERAGE function that refers to the surplus funds balance for the prior and current period. As mentioned earlier, we do not have balances yet, but when we do, these will be the basis for multiplying by an assumed interest rate. The real question for this piece of the formula is: Why do we use the AVERAGE function? The reason is that we do not know exactly when the surplus funds were created. In a model that is set to annual periodicity, it is unlikely that all of the surplus funds were created exactly at the beginning of the period. Most likely they came in over time. For this reason, we take an average of the balances between the prior period and the current period to create a balance estimate. If the model is set to a more specific periodicity, or the model user knows exactly when the funds came in, the AVERAGE function can be eliminated and a more specific balance reference used.

   The second piece of the formula is an OFFSET MATCH combination—something with which we are very familiar by now. It matches the user-indicated surplus funds rate (inputs_SurplusFundsRate) against the list of possible interest rates (lst_InterestRates). This is highly similar to the formula used to determine the rate for long-term debt issuances in Chapter 6.

   The third piece of the formula is very easy. It is the spread (inputs_SurplusFundsSpd) on top of the selected index. This part is a straightforward addition formula. Copy and paste this formula over the range E22:J22.

9. Repeat this process for cash and marketable securities. Enter the following formulas in the corresponding cells:

   E23: **=AVERAGE('BalanceSheet'!D7:E7)*(OFFSET(Vectors!E$33,MATCH (inputs_CashRate,lst_InterestRates,0),0)+inputs_CashSpd)**
   E24: **=AVERAGE('BalanceSheet'!D8:E8)*(OFFSET(Vectors!E$33,MATCH (inputs_MSRate,lst_InterestRates,0),0)+inputs_MSSpd)**

   Copy and paste each of these cells over to column J for each respective row.
10. Short-term debt interest is calculated in a similar manner. Still on the Income Statement sheet, enter the following formula in cell E28:

    =AVERAGE('BalanceSheet'!D31:E31)*(OFFSET(Vectors!E$33,MATCH (inputs_STFundsRate,lst_InterestRates,0),0)+inputs_STFundsSpd)

    Copy and paste this formula over the range E28:J28. Thus far the new area on the Income Statement sheet should look like Figure 7.4.
11. We are very close to installing the balancing mechanism. Prior to this, we need to make sure everyone has the exact same calculations. To ensure this, repeat step 1 for the complete example model that is on the CD-ROM. If you are following along by building your model in a step-by-step process, your total assets and total liabilities plus equity should be identical to the example model at this point. If not, compare all assumptions. A good troubleshooting method is to check each section of the balance sheet to see whether your numbers are the same. If there is a difference in one of those sections, it will give you a hint as to the area that you should focus your attention on.

    This is not suggesting that the total assets should equal total liabilities plus equity. In fact, they should not since we have yet to install the balancing mechanism. This step is to make sure that all other calculations are the same. Otherwise, if your model does not balance it could be due to a host of missed or erroneous prior calculations that would be difficult to troubleshoot with the balancing method installed. It is much easier to troubleshoot problems *prior to balancing* by putting in hard-coded proxy values for surplus funds and short-term debt

	A	B	C	D	E	F	G	H	I	J
22		Surplus Funds			-	1.36	1.36	2.25	7.05	12.27
23		Cash		0.30	0.45	0.29	0.11	0.12	0.13	0.14
24		MS Securities		0.20	0.18	0.20	0.22	0.24	0.27	0.29
25		Total Interest Income		0.50	0.64	1.85	1.69	2.62	7.46	12.70
26										
27		Interest Expense								
28		ST Debt			0.53	0.53	-	-	-	-

FIGURE 7.4 The plugs contribute to interest income and expense that is taken into account on the income statement.

and identifying differences in sections of the balance sheet between the model provided on the CD-ROM and the model that you are building.

If you are having a difficult time getting your model to produce similar results as the example model, it is acceptable to save a version of the example model, put the 1 values in the surplus fund and short-term debt sections above, and use that model to continue this Model Builder. If you do choose to use this method, many of the upcoming steps will be already completed for you.

12. Assuming that all calculations are correct in your model, go to the Balance Sheet sheet. Enter the following text in the corresponding cells:

    B48: **Surplus Cash**
    B49: **Required Short-Term debt**

13. We want to quantify the differences between the assets without the surplus funds plug, and the liabilities plus equity without the short-term debt plug. If we did a simple subtraction of the two, we could possibly get a negative number, depending on which figures we subtracted first. What we should do is set up an absolute system where only positive numbers are returned. If surplus funds are positive, it means that there should be no need for short-term debt. Conversely, if short-term debt is positive, it means that there should be no surplus funds available. We basically want to create a floor at zero. In the previous chapter, we learned that a MAX function can be used to create a floor. Enter the following formula in cell E48:

    =MAX((SUM(E30,E32,E35,E39,E40,E41,E42)+SUM(Debt!E22,Debt!E32, Debt!E42))-SUM(E7,E8,E9,E13,E14,E19,E23,E25),0)

    Copy and paste this formula over the range E48:J48.

14. Repeat this process for cell E49, but enter the following formula where the references are reversed:

    =MAX(SUM(E7,E8,E9,E13,E14,E19,E23,E25)-(SUM(E30,E32,E35,E39,E40, E41,E42)+SUM(Debt!E22,Debt!E32,Debt!E42)),0)

    Copy and paste this formula over the range E49:J49. The new section on the Balance Sheet sheet should look like Figure 7.5.

	B	C	D	E	F	G	H	I	J
46	**Total Liabilities & Equity**		**138.04**	**270.90**	**313.27**	**384.69**	**439.68**	**515.09**	**608.42**
47									
48	Surplus Cash			0.00	71.09	2.78	112.26	228.57	350.80
49	Required Short-Term Debt			19.92	0.00	0.00	0.00	0.00	0.00

FIGURE 7.5 The plugs need to be calculated so that they can be fed back into the system to determine their final amounts.

15. We are soon going to link up everything. The problem is that we will have a circular reference when we do this. If you think about it, we have determined how much surplus or short-term debt we need to balance the model. However, in that same period, the interest income or expense is dependent on the figure that gets plugged. But, the figure that gets plugged is dependent on the interest income or expense since it is connected to retained earnings! This circularity can be solved in two ways: setting Excel to calculate with iterations or using loops in VBA code to optimize the problem. Since the VBA code is more advanced and will be explained in Chapter 12, we will first implement a solution using iterations. To do this, we must set Excel to calculate with iterations.

For Excel 2003 or earlier: Go to **Tools** and select **Options**. On the Options dialogue box there should be a tab called Calculation. Select the **Calculation** tab; there is a checkbox for Enable Iterations, followed by a field for Maximum Iterations, and Maximum Change. Just check the box **Enable Iterations**. Press **OK**.

For Excel 2007: Go to the Office button and select **Excel Options** in the bottom-right area. Select the **Formulas** menu. On the upper-right section of the Formulas menu there should be a checkbox for Enable Iterative Calculation, followed by a field for Maximum Iterations, and Maximum Change. Just check the box to **Enable Iterative Calculation**. Press **OK**. The area from Excel 2007 is show in Figure 7.6.

16. Go to the Debt sheet and enter the following reference in cell E14:

='Balance Sheet'!E48

Copy and paste this formula over the range E14:J14.

17. Back on the Balance Sheet sheet, enter the following reference in cell E31:

=E49

Copy and paste this formula over the range E31:J31.

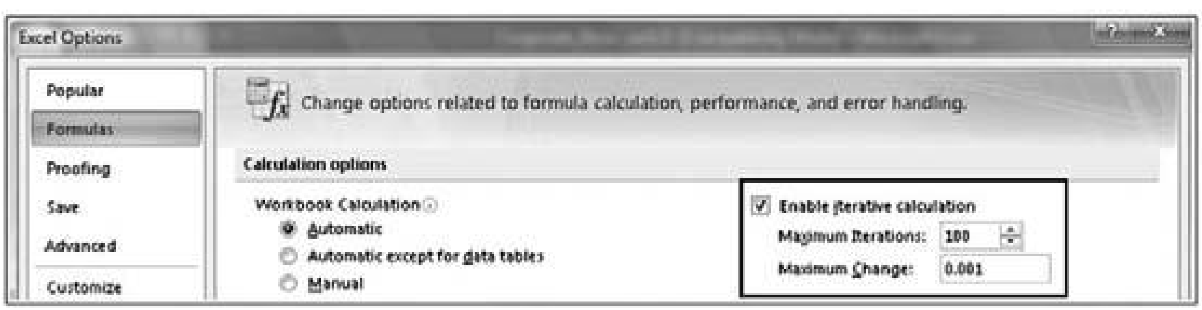


FIGURE 7.6 Iterative calculation is activated under Excel Options. It allows Excel to iterate through circular references.

18. At this point the model should be balanced. Verify this by adding up all of the total assets for each period and comparing that figure to the total liabilities plus equity. You might also want to check each period to make sure that the assets equal the liabilities plus equity. There are a few things that are very important to realize about what we have just done:
    a. The model is mathematically correct, but I cannot stress enough that this does not mean your *analysis* is correct! One participant in a corporate valuation course that I was teaching in Nigeria exclaimed, "This is voodoo accounting!" Although I won't take it to that level, I will say we are making assumptions here to adhere to accounting principles. We need to verify that our results are reality based. For instance, in a previous model that I worked on for a large holding company transaction, every stress scenario worked. The model was very large and it took me a while to figure out why, but it all came back to the short-term facility plug that the model builder had set up. In the stress cases, this plug was reaching levels from $300 million to $400 million. Unfortunately, the company had only $175 million in short-term facility available. So, in a worst-case scenario the model was still showing everyone getting paid because all of the shortfalls were being covered by the short-term facility plug. In reality, the company would have gone into default because it would not have been able to access such large amounts of short-term debt. We will see how we can set up the model to warn ourselves about this issue in the Internal Validation section of Chapter 8.
    b. Plugs sometimes come under criticism for their simplicity. Allowing only either a surplus or drawing down on one source such as short-term debt seems limited. Plugs can be set up to be more complicated, though. One can direct a certain amount of shortfall on the liability and equity side to multiple sources such as debt and equity. In such a way we can maintain management's expected capital structure plan. We can also hook up the debt plug to other sources of debt such as a liquidity facility, where there are drawdowns and repayments with surplus.
    c. The other issue with plugs is that there is a circular reference that we have allowed on the sheet, opening the possibility of error. It is a correct circular reference in that we understand exactly how it is operating and it gets us to an acceptable answer. We can verify there is a circular reference by looking at Excel's status bar. The status bar is the bar in the far bottom-left that normally says "Ready." When Excel's calculation settings are set to manual and the sheet is uncalculated, or if there is an active circular reference, the status bar will say "Ready Calculate." The "Calculate" means that the sheet is not calculated. If you are unfamiliar with Excel's calculation settings, refer to the Toolbox at the end of this chapter. The problem with a circular reference is that even if Excel's calculation setting is set to Automatic, the status bar will still display "Calculate." On its own it is not a problem, but what if we accidentally create another circular reference? We may see the error, but troubleshooting it will be difficult given the purposeful circular reference that

we just implemented. This is why I lean toward using VBA subroutines to solve circularities or optimize models. Those subroutines can enter the correct value in any cell we want as a hard-coded figure rather than maintaining a circular reference. We will see how to do this in Chapter 12.

d. Overall, plugs should be used sparingly. The projections of a company should be set up in a logical manner from the start. For instance, it would be unusual to increase capital expenditures by a significant amount and not plan on funding it, thus allowing the liability and equity plug to pick up the slack. Our models should reflect carefully laid-out scenarios where we provide as much logical data as possible and rely on plugs for minor aberrations.

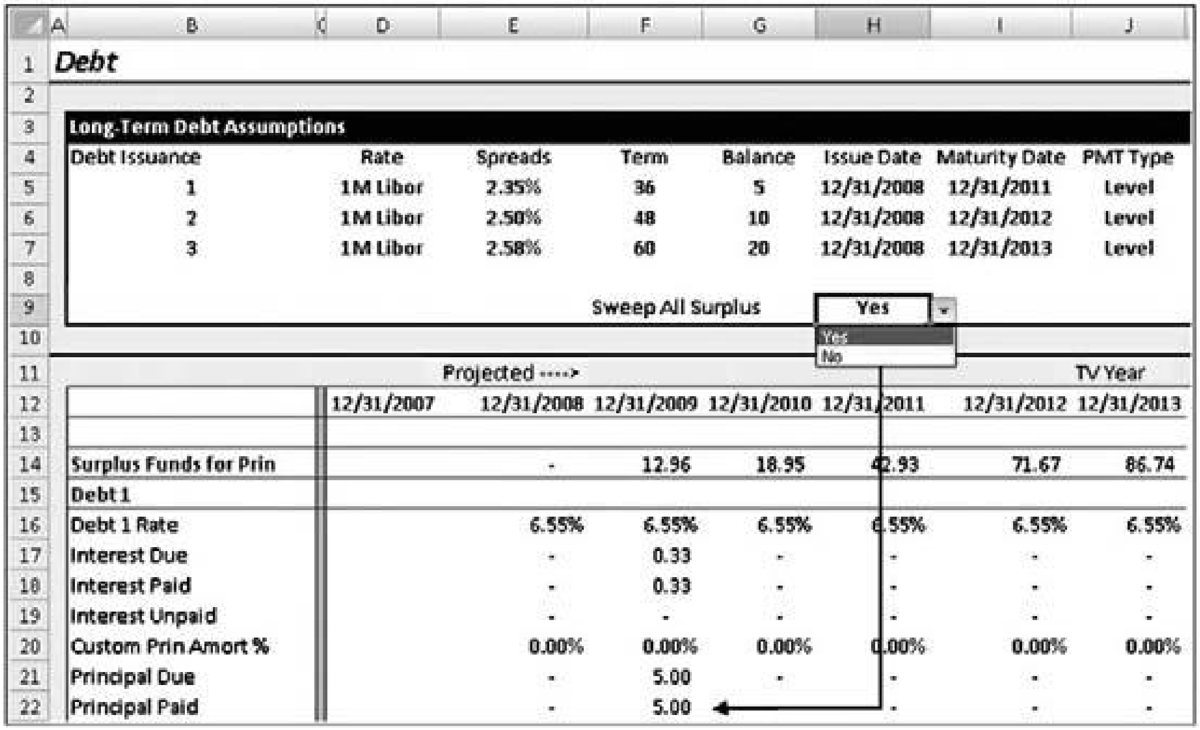
WORKING WITH THE MODEL

At this point we have a working, dynamic model that can balance itself by utilizing either surplus cash or short-term debt. We should now try changing a few assumptions to see their effects on the model:

- *Cash sweep:* We should see the effect of turning the cash sweep on, since its current setting is *off*. First, let's look at what is happening when the cash sweep is turned off. We can see in the example model that we have a shortfall of funds the first period, followed by surplus funds in 2009 and beyond. Looking at 2009 as a focal point, we can see that we have 8.17 of scheduled principal due in that year. Fortunately, there is plenty of surplus cash to pay this principal (71.09). After paying the principal, we are left with 62.92, which is the surplus cash displayed on the balance sheet.

  Now, if we activate the cash sweep by switching cell H9 on the Debt sheet to "Yes," we will see a dramatic change. In this case, we have built in an acceleration of debt, meaning that all of the surplus funds are distributed to the debt holders. Looking at the Debt sheet, we see that all of the debt is paid off. The example set here would be an acceleration of debt caused by some breach of a covenant. Make sure to set cell H9 back to "No" before proceeding on to the next assumption change. Figure 7.7 depicts where the change should be made.
- *Revenue growth:* Our next example is changing the revenue growth vectors, which are the most influential factors in the model. First, we should take a few notes regarding the current state of the model. The default scenario is set to Base Case, which produces $1,257.74 of surplus funds post–principal paydown from December 2009 to December 2013 (sum up range F6:J6 on the Balance Sheet sheet). Note that all three debt issuances get their interest and scheduled principal paid on time (look at the Interest and Principal paid and unpaid rows on the Debt sheet).

  Now, switch the scenario on the Assumptions sheet (cell D31) to Downside Case. Look at Figure 7.8 to see the scenario selector that should be changed. Assuming that the Downside Case assumptions that are used in the example model



	B	D	E	F	G	H	I	J
1	*Debt*							
2								
3	**Long-Term Debt Assumptions**							
4	Debt Issuance	Rate	Spreads	Term	Balance	Issue Date	Maturity Date	PMT Type
5	1	1M Libor	2.35%	36	5	12/31/2008	12/31/2011	Level
6	2	1M Libor	2.50%	48	10	12/31/2008	12/31/2012	Level
7	3	1M Libor	2.58%	60	20	12/31/2008	12/31/2013	Level
8								
9				Sweep All Surplus		Yes		
10						Yes / No		
11			Projected ·····>					TV Year
12		12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
13								
14	Surplus Funds for Prin		-	12.96	18.95	42.93	71.67	86.74
15	Debt 1							
16	Debt 1 Rate		6.55%	6.55%	6.55%	6.55%	6.55%	6.55%
17	Interest Due		-	0.33	-	-	-	-
18	Interest Paid		-	0.33	-	-	-	-
19	Interest Unpaid		-	-	-	-	-	-
20	Custom Prin Amort %		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
21	Principal Due		-	5.00	-	-	-	-
22	Principal Paid		-	5.00	-	-	-	-

FIGURE 7.7 Switching the cash sweep on takes all surplus cash and applies it to the debt in the payment manner selected in the debt assumptions.

are implemented in the model you are using, there should be some considerable differences. Go back to the Balance Sheet sheet and sum up the surplus funds post-principal. You will notice this has decreased greatly to $954.08.

If a scenario was used where a growth got worse, a few things could happen that the analyst might have to customize. The first is that in such a downside case there might be covenants to protect the senior tranches of debt. Subordinate tranches would probably be locked out of principal payments until the more senior tranches are paid.

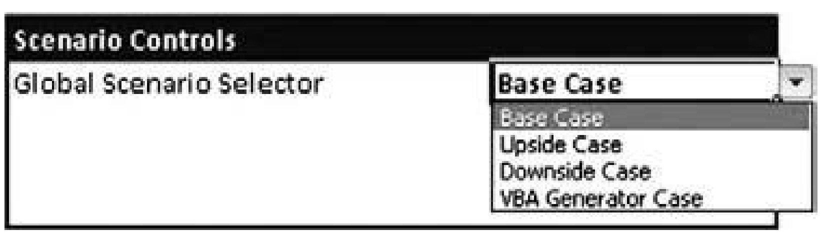


FIGURE 7.8 Changing the scenario to a stress case produces less revenue and has dynamic impacts on the modeling results of many sections. Note that "VBA Generator Case" will not show up on your drop-down list yet. It will be implemented in Chapter 12.

The other issue that sometimes occurs is the use of a short-term facility to pay current portions of long-term debt. In our model setup, we have restricted principal paydown to occur only when there are surplus funds available. In some models you may notice the model builder has allowed the short-term facility to cover interest or principal payments on long-term debt. This is a concern because you are essentially swapping debt and possibly prolonging a cash flow problem that is leading toward default.

All of the results from dropping revenue make sense. In the downside case, we lowered revenue and increased expenses, which stresses the cash flow. This is evident in our model when we examine the reduced surplus funds. Make sure to switch back to the base case after finishing this analysis.

- *Increased capital expenditure:* Next we will see a very tangible effect on cash flow. First, notice the surplus funds for 2010 of $99.39. Now, we are going to hold all assumptions constant, but increase the third capital expenditure in 2010. This area is shown in Figure 7.9. If we do not adjust funding for this project, then there are going to be problems affording it. This should be easy to spot in the model.

  Change the third capital expenditure on the Assumptions sheet (cell D19) from $10 to **$175**. Now, take a look at the surplus funds in 2010. You will notice that they have been reduced to zero. In fact, not only have surplus funds been reduced to zero, but debt goes unpaid. What is happening is that the capital expenditure costs money and there is barely enough from earnings, long-term financing, equity, or cash on hand to pay for it. Doing this causes severe stress on the firm's ability to keep to scheduled principal repayments. In 2010, principal payments are missed because there are limited surplus funds to pay them.

  We can now use the model as an optimization tool. We can determine how much we can increase the third capital expenditure until there is no unpaid scheduled principal. Decrease the third capital expenditure to **$108**. You will

	A	B	C	D
14				
15		**CAPEX Assumptions**		
16			Depreciation Method	Amt
17		**Capex 1**	**Straight Line**	**85**
18		**Capex 2**	**Straight Line**	**25**
19		**Capex 3**	**Straight Line**	**10**
20		**Capex 4**	**Straight Line**	**0**

FIGURE 7.9 Increasing capital expenditures while holding everything else constant will impact the affordability of other liabilities.

notice that all of the scheduled principal can be paid. Perhaps it is not optimized, so we should test out increasing the third capital expenditure to **$109**. This causes unpaid debt. If we were to keep going back and forth, perhaps using a divide-and-conquer algorithm (dividing the previous correct attempt and the current wrong attempt by half until an optimal solution is found), we would find that $108.20 could be spent on capital expenditure and all the debt could be paid. Later, we will see that there are ways to automate the search process using tools built into Excel such as Goal Seek and Solver. Make sure to switch the third capital expenditure back to **10** prior to proceeding.

THE MODEL AS AN ANALYSIS TOOL

Now that we have completed most of the plumbing in the model to get it to a dynamic stage, we will rapidly increase our ability to use it for analysis. Whereas this book heavily focuses on how to create a dynamic model, the real value an analyst provides is in using the model appropriately. To ensure that the model is being used appropriately, we should build in validation tests that check to make sure logical results are being returned. Chapter 8 focuses on validating the model through commonly seen calculations that check the cash flow movements of important items related to the company's viability, such as working capital. These items are summarized in the cash flow statement, which can be used in a financial model as a reconciliation tool.

TOOLBOX: EXCEL'S CALCULATION MODES

In many of my valuation modeling classes I have often received the question, "I'm dragging the formula over exactly as you are saying, but nothing is changing on my screen." The most common response and solution to that is to check the calculation mode setting.

For Excel 2003 and earlier: Go to **Tools—Options** and select the **Calculation** tab. On the Calculation tab there should be an option button for three different calculation settings, each described here:

- *Automatic:* recalculates the entire workbook any time a change is made to the workbook. Default mode of most Excel workbooks and models.
- *Automatic without Tables:* recalculates the entire workbook any time a change is made to the workbook, except for data tables that a user created. If you are unfamiliar with data tables, it is not necessary to learn them if you decide to learn VBA. Data tables are useful for scenario analysis, but hamper calculation time when used frequently. The slow calculation time is why an option exists to recalculate everything except the tables. The other reason is that a user might want data stored in the table that is reflective of a past scenario.

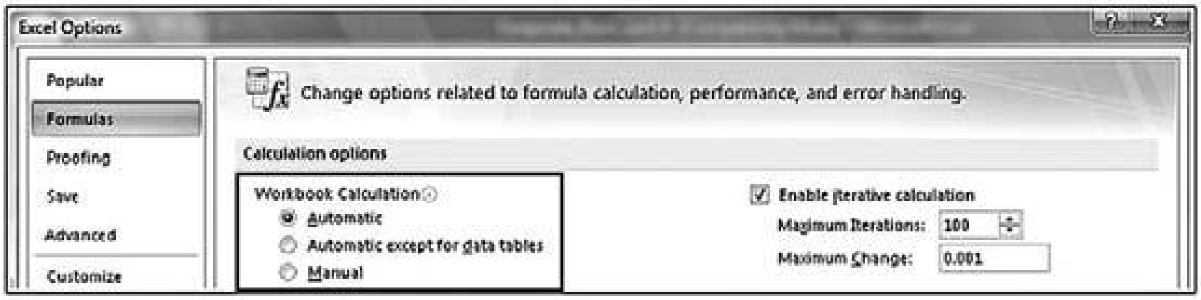


FIGURE 7.10 In Excel 2007, we can switch the calculation mode under Excel Options—Formulas.

- *Manual:* recalculates the entire workbook only when the user presses **F9**. Changes made to immediate cells or ranges of cells will be calculated after **Enter** is pressed, but connected links or dragged items will not change until **F9** is pressed.

For Excel 2007 users: The same possible calculation modes are available, but they must be accessed by clicking on the **Office** button, pressing the **Excel Options** button, selecting **Formulas**, and choosing one of the three option boxes under the Workbook Calculation section in the upper-left area of the dialogue box. Figure 7.10 shows the area to change the Workbook Calculation mode.

8

Reconciling Cash Flow

Most of the core calculations that generate cash flow in from assets and those that set up our liabilities and equity are done. However, there are numerous calculations necessary to understand more about the company's performance and financial health. Primarily, we should trace cash that is flowing through the company to see how much is earned or used through operations, investing, and financing. In particular, when assessing the viability of a company we should pay particular attention to operational cash flow, which is partially comprised of working capital needs or excess. Once we know more about the sources and uses of cash, we should also take time to implement internal validations that make sure the calculations backing these cash flow figures are absolutely correct.

THE CASH FLOW STATEMENT

The last major financial statement that we have yet to discuss or implement is the cash flow statement. As alluded to in the opening paragraph, this statement organizes the cash flows of a company by operational, investing, and financing activity. The cash flow statement provides an analyst with a picture of the sources and uses of cash in a company. It is relatively simple to set up since nearly all of the calculations are references to sections already calculated in the model. No new conceptual calculations are necessary. Figure 8.1 shows a graphical representation of the cash flow statement in relation to other parts of the model.

Financial modelers use cash flow statements in two ways. First, if one does not balance the surplus cash in a similar manner as we did on the Debt and Balance Sheet sheets in Chapter 7, he or she will typically use the cash at the end of the period on the cash flow statement to balance the model. Although this is an acceptable and common means of balancing a model, it adds a layer connectivity that is not needed. The cash flow statement is really just referencing other parts of the model, and to balance a model one needs to interact only with the Income Statement, Balance Sheet, and supporting sheets.

If a financial modeler implements a balancing system similar to what we have done in Chapter 7, which is common, then the cash flow statement can be used to reconcile cash. Any change in all of the cash items on the balance sheet between

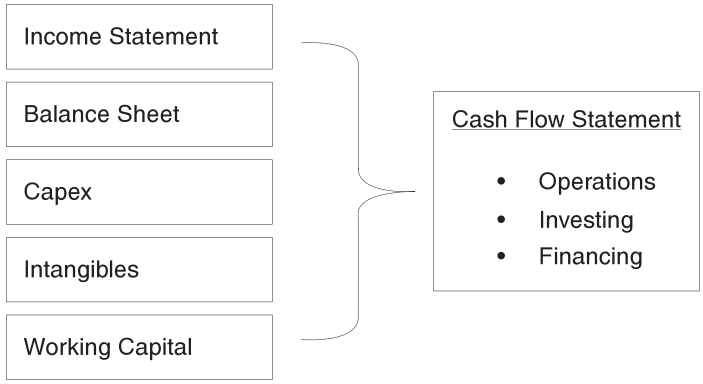


FIGURE 8.1 The cash flow statement is created from other sheets that have already been created in the model.

periods should be identical to the change in cash from the cash flow statement. If there is a difference, it means either items are missing from the cash flow statement or other parts of the model are miscalculating. With this check in place, the cash flow statement becomes an invaluable tool for troubleshooting a model.

WORKING CAPITAL

One goal that we are getting closer to is ultimately corporate valuation. A large part of corporate valuation modeling is understanding the cash flow of a company—particularly cash flow related to operations. Within operational cash flow, an important set of calculations that are often separated are those that allow us to calculate working capital needs.

We should be very clear with semantics at this point:

- *Working capital needs:* the difference between the current period's working capital and the prior period's working capital.
- *Working capital:* in a single period, the difference between current assets and current liabilities. Typically, cash is excluded from this calculation, unless cash is an integral part of the company's day-to-day business or the company operates in country where high cash balances (possibly in different currencies) are necessary due to exchange rate and/or inflation problems.
- *Current assets:* all assets that are liquid within 12 months.
- *Current liabilities:* all liabilities that are due within 12 months.

Working capital is sometimes confusing because people reference it in two ways: first as working capital needs and second as cash change. What is the difference

Calculating Working Capital Needs and Cash Change

	2009	2010		
Current Assets				**Cash Change**
Accounts Receivable	150	0		150
Inventory	0	300		-300
Current Liabilities				
Accounts Payable	0	200		200
Other Current Liabilities	400	0		-400
Working Capital	-250	100		
Working Capital Need		350	**Total Cash Change**	-350

FIGURE 8.2 Working capital should be assessed by the change in cash; the opposite is thought of as the working capital needs.

between these two concepts? Let's use an example. Imagine that we had the current assets and current liabilities in Figure 8.2.

We could take the difference between current assets and current liabilities each period and then take the difference between the current and prior period. In this case, we would have a positive number. This positive number represents the working capital that is needed to keep the business operational. Without this cash flow, we would not have been able to fund the purchase of inventory, which is highly critical, nor pay down our other current liabilities, where nonpayment could lead to default.

Another thing to look at is the cash change method. The question a financial analyst needs to ask is: "What is the impact on cash?" This is often a confusing concept for people to get quickly. For instance, when inventory increases from 0 to 300 in our example, the cash impact is –300. This is because for us to create 300 of inventory we need 300 of cash. Conversely, the opposite happens for liabilities. When accounts payable increases from 0 to 200, our cash change is positive because we have received a good or service without laying out any cash.

MODEL BUILDER 8.1: CALCULATING WORKING CAPITAL

1. Working capital is a useful calculation to separate out since it will be used for the cash flow statement, free cash flow, and for the analyst's judgment of operational performance. Some financial modelers choose to do this calculation within the cash flow statement, but given its importance we will create a separate sheet for the working capital. Insert a sheet after the Debt sheet and name it **Working Capital**.

2. Enter the text **Cash Change Method** in cell A2. This is to advise model users that we will be calculating the change in cash as described in the paragraph preceding Model Builder 8.1.
3. Set up the dates and timing for the sheet by entering the following formulas in the corresponding cells:

   E2: **=Vectors!E9**
   E3: **=Vectors!E10**

   Copy and paste these formulas over to column Z, within their respective rows. Notice we start with the first projection period since we do not have any information prior to the first historical period. There would be no way to calculate the cash change for the historical year without the year prior to the historical year's information.
4. We should establish labels for the upcoming working capital calculations. Something new to our model is that this is the first time that negative numbers will appear and remain part of the calculations. It is easier to work with changes in cash by viewing reductions in cash as negative values. Enter the following text in the corresponding cells:

   C4: **(Inc.)/Dec. in Acct. Rec.**
   C5: **(Inc.)/Dec. in Inventory**
   C6: **(Inc.)/Dec. in Other Current Assets**
   C7: **Inc./(Dec.) in Acct. Pay.**
   C8: **Inc/(Dec.) in ST Debt**
   C9: **Inc./(Dec.) in Other Current Liab.**
   C10: **Net Working Capital Cash Change**

5. Our first actual calculations will focus on the current assets. Enter the following formulas in their corresponding cells:

   E4: **='Balance Sheet'!D9-'Balance Sheet'!E9**
   E5: **='Balance Sheet'!D13-'Balance Sheet'!E13**
   E6: **='Balance Sheet'!D14-'Balance Sheet'!E14**

   Copy and paste these formulas over to column J while maintaining the formula within its respective row.
6. We should calculate the cash change for the current liabilities. Enter the following formula in cell E7:

   ='Balance Sheet'!E30-'Balance Sheet'!D30

   Copy and paste this formula over the range E7:J9.

	A B	C	D	E	F	G	H	I	J
1	***Working Capital***								
2	Cash change method			Projected ---->					TV Year
3				**12/31/2008**	**12/31/2009**	**12/31/2010**	**12/31/2011**	**12/31/2012**	**12/31/2013**
4		(Inc.) Dec. in Acct. Rec.		-0.64	-1.81	-1.99	-2.20	-2.42	-1.05
5		(Inc.) Dec. in Inventory		4.44	-0.63	-0.70	-0.78	-0.87	-0.69
6		(Inc.) Dec. in Other Current Assets		-1.21	-0.23	-0.25	-0.27	-0.30	-0.13
7		Inc. (Dec.) in Acct. Pay.		2.57	1.10	2.11	2.35	2.61	2.01
8		Inc. (Dec.) in ST Debt		19.92	-19.92	0.00	0.00	0.00	0.00
9		Inc. (Dec.) in Other Current Liab.		3.62	0.68	0.75	0.82	0.91	0.39
10		**Net Working Capital Cash Change**		**28.69**	**-20.80**	**-0.09**	**-0.08**	**-0.07**	**0.53**

FIGURE 8.3 The Working Capital sheet provides a detailed look at cash necessary to keep the core business operational.

7. Sum up the columns for each period to see the net working capital cash change by entering the following formula in cell E10 and copying and pasting it over the range E10:J10:

   =SUM(E4:E9)

   Figure 8.3 shows what the completed section should look like.

MODEL BUILDER 8.2: BUILDING THE CASH FLOW STATEMENT

1. The cash flow statement is a separate worksheet in the example model. Insert a new worksheet after the Working Capital sheet and name it **Cash Flow Statement**. On the Cash Flow Statement sheet, enter the text **Cash Flow Statement** in cell A1.
2. We will need historical information, so we should create the dates starting with the historical period. Enter the following formulas in the corresponding cells:

   D2: **=Vectors!D9**
   D3: **=Vectors!D10**

   Copy and paste these formulas over to column Z in their respective rows.
3. The first section that we will complete is cash flow from operations. Enter the following text to create labels in the following corresponding cells:

   B5: **Operations**
   B6: **Net Income**
   B7: **Depreciation & Amortization**
   B8: **Change in Working Capital**
   B9: **Cash from Operations**

4. We start cash flow from operations with net income from the year. We will directly reference the income statement to get this number. Still on the Cash Flow Statement sheet, enter the following reference in cell E6:

   ='Income Statement'!E36

   Copy and paste this formula over the range E6:J6.
5. Net income is not the operational cash flow because non-cash items have been removed. In our example model, we have two forms of non-cash items: depreciation and amortization. Real cash flow is not reduced by these items and should therefore be added back to the operational cash flow. Enter the following formula in cell E7:

   ='Income Statement'!E15+'Income Statement'!E16

   Copy and paste this formula over the range E7:J7.
6. Earlier in this chapter we identified working capital as an integral part of operations. If there is a need to fund working capital, then this must be removed from the cash flow. Similarly, if there is an excess amount of cash from working capital, this can add to the cash flow. Enter the following formula in cell E8:

   ='Working Capital'!E10

   Copy and paste this formula over the range E8:J8. Notice that since we used the cash change method on the Working Capital sheet we can directly reference that sheet here. Some financial models build the working capital calculation into this section of the cash flow statement.
7. Since we are working with positive values representing cash flow in and negative values representing cash flow out, we can sum the values for each period to get to our total cash flow from operations. Enter the following formula in cell E9 and copy and paste it over the range E9:J9:

   =SUM(E6:E8)

   Refer to Figure 8.4 for the current development of cash flow from operations section of the cash flow statement.
8. The next section of the cash flow statement focuses on investing activities. Enter the following text in the corresponding cells:

   B11: **Investing**
   B12: **Disposal of Fixed Assets**
   B13: **Capital Expenditures**
   B14: **Intangible Acquisition**

	A	B	C	D	E	F	G	H	I	J
1		***Cash Flow Statement***								
2					Projected ---->					TV Year
3				**12/31/2007**	**12/31/2008**	**12/31/2009**	**12/31/2010**	**12/31/2011**	**12/31/2012**	**12/31/2013**
4										
5		**Operations**								
6		Net Income			76.75	73.68	83.42	93.91	112.19	130.01
7		Depreciation and Amortization			—	22.33	24.83	27.93	22.10	5.60
8		Change in Working Capital			28.69	(20.80)	(0.09)	(0.08)	(0.07)	0.53
9		**Cash from operations**			105.45	75.21	108.17	121.76	134.22	136.14

FIGURE 8.4 The cash flow from operations section helps us determine the operational viability of the firm over a forecast period.

B15: **Sale of LT Investments**
B16: **Purchase of LT Investments**
B17: **Cash from Investing**

9. The first entry of the cash flow from investing section, disposal of fixed assets, may be confusing since we have not covered it. It's mainly here to demonstrate how the model can be scaled up to include more granular detail. At some point one may want to add items or concepts not discussed. One of the best places to start is determining where it is on the cash flow statement and where the cash would come from. In this case, an asset disposal would have cash flow through the income statement, depending on a gain or loss on sale. Since this is a scalable section not covered by the example model, we can put in proxy values of **0** right now for each cell in the range E12:J12.
10. The more obvious investing activities are capital expenditures. Here we can directly reference the Capex sheet. Enter the following formula in cell E13:

    =-Capex!E10

    Copy and paste this formula over the range E13:J13. Notice that there is a negative sign in front of the formula. This is because capital expenditures are always cash flow out and we used positive values in their calculation on the Capex sheet.
11. Just as intangibles were very similar in calculation to capital expenditures, their setup on the cash flow statement is as well. Enter the following formula in cell E14:

    =-Intangibles!E10

    Copy and paste this formula over the range E14:J14.
12. The next part of the cash flow from investing section is a bit different from any that we have seen thus far. This part is where we see whether there is cash flow, cash flow out, or both from the sale or purchase of long-term investment. As

	A	B	C	D	E	F	G	H	I	J
15		Sale of LT Investments			—	—	—	—	—	—
16		Purchase LT Investments			(14.01)	(2.26)	(2.49)	(2.75)	(3.03)	(1.32)
17		**Cash from Investing**			(134.01)	(7.26)	(15.49)	(2.75)	(3.03)	(1.32)

FIGURE 8.5 Certain items benefit from a more detailed look at the differences between periods. Here we can see when a purchase or a sale occurred, not just a net number.

model builders, we have the choice to consolidate the sale or purchase of assets to one row or split it into two. What's the difference, you might ask? One row is easier to implement since it is just the difference between the two periods. However, two rows give us the flexibility to see whether we had both a sale and a purchase or one or the other. Leaning toward a more detailed approach, enter the following formula in cell E15:

=MAX('Balance Sheet'!D25-'Balance Sheet'!E25,0)

This formula takes the difference between the prior year and the current year's long-term investments. If the number is positive, it means there was a net sale of assets, but if it is negative, it means there is a net purchase of assets. Since we are focused only on sales in row 15 we use a MAX function as a floor to prevent any negative values from being introduced into this row. Some readers will wonder, "If we have only one line for long-term investments on the balance sheet, why does it matter to split it into two separate rows?" This is a valid point; the method of handling multiple investments is just being shown for demonstration purposes. Copy and paste this formula over the range E15:J15. Figure 8.5 shows how this section is developed.

13. To do the purchase of long-term investments, enter the following formula in cell E16:

=MIN('Balance Sheet'!D25-'Balance Sheet'!E25,0)

Copy and paste this formula over the range E16:J16. Notice that we use the MIN function to create a cap at zero. Since a purchase of long-term investments is cash flow out, this number should be only negative. Once again, it is merely for demonstration purposes because in our model we have only one line for long-term investments on the balance sheet.

14. We now sum up all of the cash changes for investing with the following formula in cell E17:

=SUM(E12:E16)

Copy and paste this formula over the range E17:J17. Figure 8.6 shows the development of the investing section of the cash flow statement.

	B	E	F	G	H	I	J
11	**Investing**						
12	Disposal of Fixed Assets	—	—	—	—	—	—
13	Capital Expenditures	(110.00)	—	(10.00)	—	—	—
14	Intangible Acquisition	(10.00)	(5.00)	(3.00)	—	—	—
15	Sale of LT Investments	—	—	—	—	—	—
16	Purchase LT Investments	(14.01)	(2.26)	(2.49)	(2.75)	(3.03)	(1.32)
17	**Cash from Investing**	(134.01)	(7.26)	(15.49)	(2.75)	(3.03)	(1.32)

FIGURE 8.6 Cash flow from investing is important since the investments may be required to keep the business running in the future. Also, we might want to see whether a lot of funds were derived from the sale of any assets rather than from operational income.

15. The final section we need to work on is cash flow from financing. Enter the following text in the corresponding cells:

    B19: **Financing**
    B20: **Dividends Paid**
    B21: **Inc. LT Borrowings**
    B22: **Dec. LT Borrowings**
    B23: **Inc. Common Stock**
    B24: **Dec. Common Stock**
    B25: **Cash from Financing**

16. Financing brings in cash and costs cash. The first financing item is a cost: dividends paid. Enter the following formula in cell E20:

    =-'Income Statement'!E38

    Copy and paste this formula over the range E20:J20. As with capital expenditure and intangibles, notice that a negative sign is put in front of the value since it is cash flow out.
17. Next we will focus on long-term debt. We will take a similar approach to the sale and purchase of long-term investments and create two separate rows for long-term debt: one for increases and the other for decreases. In cell E21, enter the following formula:

    =MAX('Balance Sheet'!E35-'Balance Sheet'!D35,0)

    Once again, we use the MAX function as a floor to prevent negative numbers, since any increase in long-term debt will be a positive. Also be careful with the order of subtraction. For assets, we subtract the current period from the prior period. For liabilities, we subtract values from the prior period from the current period. Copy and paste this formula over the range E21:J21.

18. Create opposite functionality for decreases by enter the following formula:

    =MIN('Balance Sheet'!E35-'Balance Sheet'!D35,0)

    Copy and paste this formula over the range E22:J22.
19. The same concepts will be applied for common stock. Enter the following formulas in the corresponding cells:

    E23: **=MAX('Balance Sheet'!E41-'Balance Sheet'!D41,0)**
    E24: **=MIN('Balance Sheet'!E41-'Balance Sheet'!D41,0)**

    Copy and paste these values over to column J in their respective rows.
20. Finally, in cell E25, sum up the cash flow changes from financing by entering the following formula:

    =SUM(E20:E24)

    Copy and paste this formula over the range E25:J25. The final section, cash flow from financing, is shown in Figure 8.7.
21. We can now add each of the cash flow changes from the three cash flow sections: operations, investing, and financing. Enter the following formula in cell E27:

    =E9+E17+E25

    Copy and paste this formula over the range E27:J27. Also enter the text **Net Changes in Cash** in cell B27 to label this row.
22. At this point, the cash flow statement is done, allowing us to assess where cash is coming in from or going out to. However, since we balanced our model entirely on other sheets, we may want to see whether we accounted for everything by reconciling the cash flow movements from the cash flow statement with the cash balances on the balance sheet. To create such a comparison, we need to calculate

	A	B	C	D	E	F	G	H	I	J
19		**Financing**								
20		Dividends Paid			(5.00)	(5.00)	(10.00)	(10.00)	(10.00)	(10.00)
21		Inc. LT Borrowings			35.00	—	—	—	—	—
22		Dec. LT Borrowings			—	(8.17)	(8.17)	(8.17)	(6.50)	(4.00)
23		Inc. Common Stock			—	—	—	—	—	—
24		Dec. Common Stock			—	—	—	—	—	—
25		**Cash from Financing**			30.00	(13.17)	(18.17)	(18.17)	(16.50)	(14.00)

FIGURE 8.7 The financing activities of a firm are very important since the capital structure of a company is a prominent indicator of financial health.

the cash balance as projected by the cash flow statement and compare it to the total cash each period from the balance sheet. Enter the following text in the corresponding cells to label the rows in this section:

B29: **Cash Balance from CF Statement**
B30: **Cash Balance from Balance Sheet**
B31: **Difference**

23. We need to complete row 30 prior to 29 since there is some historical information necessary. Row 30 is a sum of the cash from the balance sheet. This includes all sources of cash: surplus funds, cash on hand, and marketable securities. Enter the following formula in cell D30:

='Balance Sheet'!D6+'Balance Sheet'!D7+'Balance Sheet'!D8

Copy and paste this formula over the range D30:J30. This formula adds up each of the cash items. For the historic period, you will notice there is no surplus cash. This is fine since it is just adding a zero and has no effect on the calculation.

24. We will take the historic cash amount and adjust it by the net change in cash from the cash flow statement. We will then take each prior period's calculated cash using this method and add the net change in cash for each new period. These figures should be identical to those on the balance sheet. In cell E29, enter the following formula:

=MAX(D32+E29,0)

Copy and paste this formula over the range E29:J29. Note that the MAX function is used as a floor to prevent negative cash, which in this model would be calculated as short-term debt.

25. The final calculation is a comparison of the two rows. Enter the following formula in cell E31:

=E29-E30

Copy and paste this formula over the range E31:J31. There should be no difference between the cash change calculated from the cash flow statement and that on the balance sheet. If there is, you should take a logical troubleshooting approach of seeing what value the difference is and trying to find that value within the model. This calculation is particularly useful when new concepts are integrated into the model as it forces model builders to categorize the cash flow in order to reconcile cash. Figure 8.8 shows the cash reconciliation between the balance sheet and the cash flow statement.

	A	B	C	D	E	F	G	H	I	J
26										
27		Net Changes in Cash			1.43	54.78	74.51	100.85	114.69	120.82
28										
29		Cash Balance from CF Statement			15.44	70.22	144.73	245.58	360.27	481.09
30		Cash Balance from Balance Sheet		14.00	15.44	70.22	144.73	245.58	360.27	481.09
31		Difference			–	–	0.00	0.00	0.00	0.00

FIGURE 8.8 Tracking and assigning all cash flow movements in the model is a useful way to ensure the model is calculating correctly.

PREVENTING ERROR THROUGH INTERNAL VALIDATION

Now that we have all three financial statements and our core calculations complete, we should make sure that our model is working correctly. There can be innumerable tests in a model to validate its performance, but the key ones that we will focus on in the example model include:

- *Assets = liabilities + equity:* The model must always adhere to the number-one accounting principle; every period, total assets must equal total liabilities plus equity.
- *Unpaid debt principal:* If scheduled principal goes unpaid, we should be able to identify such a scenario quickly.
- *Unpaid debt interest:* Similar to principal, if interest goes unpaid, we should be able to identify it quickly.
- *ST funds limit breach:* In Chapter 7 we mentioned that while we may have a balanced model we should always verify that it reflects reality. Although a company can have unlimited surplus cash, companies have limited access to debt, and the short-term debt plug should be either limited or flagged if it exceeds the commitments that are available to the company.
- *Cash check:* In this chapter we reconciled cash using the cash flow statement. If there is a difference between the balance sheet cash and the cash flow statement, we should be able to identify this quickly.

MODEL BUILDER 8.3: IMPLEMENTING INTERNAL VALIDATIONS

1. Since the model user will primarily operate the model from the Assumptions sheet, we should set up the internal validations on that sheet. This way, when model users change an assumption, they can quickly see whether the model has a problem. On the Assumptions sheet, in the following cells, enter the corresponding text:

   L3: **Internal Validation**
   L4: **Assets = Liab + SH Equity**
   L5: **Unpaid Debt Principal**

L6: **Unpaid Debt Interest**
L7: **ST Funds Limit Breach**
L8: **Cash Check**

2. Each one of these validations will be a conditional test on the problem at hand. Depending on the conditional test setup, it can produce an "OK" or an "ERROR." Readers may notice the cell-formatting changes in the example model depending on whether "OK" or "ERROR" appears. This is achieved through a feature called *conditional formatting*, which is described at the end of this chapter in the Toolbox. Let's start with the first test by entering the following formula in cell O4:

   =IF(ROUND(SUM('Balance Sheet'!E26:I26),0)=ROUND (SUM('Balance Sheet'!E46:I46),0),"OK","ERROR")

   Working through this formula we encounter a new function: ROUND. This function rounds values to a number of decimal places provided by the user in the function. If you are unfamiliar with this function, you should reference the Toolbox at the end of this chapter. Otherwise, if we pick this formula apart we see that the formula sums up all of the periods' total assets and then rounds them so there are no decimals. The same is done for all of the periods' total liabilities and equity. An equal sign is used to see whether those two calculated values are equal. If they are equal, a TRUE value is returned, which is used by an IF function. The IF function returns an "OK" if a TRUE is returned or an "ERROR" if a FALSE is returned. The ROUND function is necessary because there can be very minute differences between values in the projected balancing. The two comparison fields from the Balance Sheet sheet are shown in Figure 8.9.
3. The next two tests are related to the long-term debt, since this is the focus of many peoples' analysis. Enter the following formulas in the corresponding references:

   O5:
   =IF(SUM(Debt!E23:I23,Debt!E33:I33,Debt!E43:I43)>0,"ERROR","OK")
   O6:
   =IF(SUM(Debt!E19:I19,Debt!E29:I29,Debt!E39:I39)>0,"ERROR","OK")

	A	B	C	D	E	F	G	H	I	J
26		Total Assets		138.04	270.90	313.27	381.38	460.29	559.51	677.92

	A	B	C	D	E	F	G	H	I	J
46		Total Liabilities and Equity		138.04	270.90	313.27	381.38	460.29	559.51	677.92

FIGURE 8.9 The first validation checks to make sure that the total assets are equal to the total liabilities plus equity each period.

These two formulas are very similar. The first one sums up the total unpaid principal for each debt issuance (rows 23, 33, and 43 on the Debt sheet) and checks to see whether that value is greater than 0. If it is, it returns an "ERROR"; otherwise, an "OK" is returned. Nearly identical is the unpaid interest check that looks to the total unpaid interest for each debt issuance (rows 19, 29, and 39 on the Debt sheet).

4. The short-term debt limit is the next test. This requires an additional field to be entered on the Assumptions sheet. Go to cell D28 on the Assumptions sheet and enter a value of **100**. Name cell D28 **inputs_STFundsLimit**. Now go back up to cell O7 on the Assumptions sheet and enter the following formula:

   =IF(MAX('Balance Sheet'!E31:J31)>inputs_STFundsLimit,"ERROR","OK")

   This test takes the maximum short-term debt balance from any period on the balance sheet and checks to see whether that value is greater than the short-term funds limit. If it is, there is a breach and an "ERROR" value is produced. Otherwise, the short-term debt is within its limits and the test passes with an "OK." Refer to Figure 8.10 for detail.

5. The final test we will implement is the Cash Check. Enter the following formula in cell O8:

   =IF(ROUND(SUM('Cash Flow Statement'!E31:I31),0)=0,"OK","ERROR")

   This formula sums up the differences between the cash flow–calculated cash balances and the balance sheet–calculated cash balances. It uses a round function in case there are a few decimals' difference and checks to see whether that value is equal to zero. If it is, that means there is no meaningful difference between the

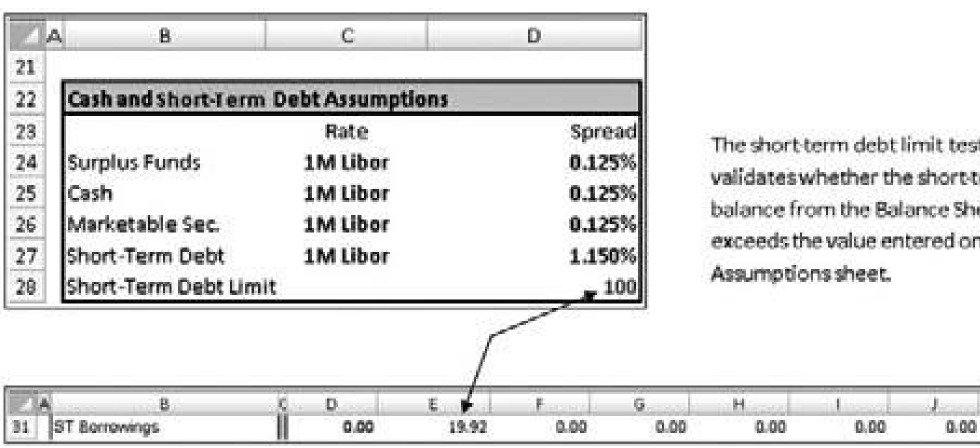


FIGURE 8.10 The short-term debt test checks the short-term debt balance on the balance sheet to make sure it does not exceed the limit set on the Assumptions sheet.

two balances and the cash reconciliation is "OK." Otherwise an "ERROR" is produced.

OTHER VALIDATIONS

The validations and reconciliation methods presented in this chapter are common ones to monitor. As your model develops, you might want to include tests that are specific to important items in your model. For instance, if you create a section on convertible debt, you might want to monitor the current stock price and interest rates to compare against the terms of the convertible debt. The test would then be focused on whether any of the convertible debt is in the money or not. Further actions could be built on the results of this test, such as assuming conversion and equity dilution. We will see in Chapter 10 that we can also automate some of the items for tests, such as the downloading of current stock prices or interest rates from the Web.

TOOLBOX

Conditional Formatting

A useful feature of Excel is the ability to alter the formatting of a cell or range of cells depending on the value of the cell or range of cells. This feature is known as *conditional formatting* since the formatting depends on conditions that the user enters. Conditional formatting is easy to use since it is a prebuilt tool in Excel, but its operation and features differ greatly between Excel 2003 and Excel 2007.

For Excel 2003 and earlier: Conditional formatting can be accessed by going to **Format—Conditional Formatting** and starting the process by selecting **Formula Is**.

For Excel 2007: Conditional formatting received a major overhaul in Excel 2007. There are now a host of new options. To access conditional formatting, go to the **Home** ribbon, **Styles** box, and select **Conditional Formatting**. The drop-down that appears provides multiple options, which are shown in Figure 8.11.

The first two options are an organization of conditional formatting rules. The first of those options is called "Highlight Cells Rules." Within this section, the user can select from a multitude of rules that will highlight a cell or range of cells with a selected format depending on the value or conditional test of values in the cell or range of cells.

The second option is called "Top/Bottom Rules." Within this section, the user can select from rules that will change the formatting of a range of cells depending on the value of each cell compared to the other values in the range. For example, one of the options is "Above Average." This rule will examine the active range that is highlighted, determine the arithmetic average, and highlight any cells in that range where the value is greater than the average.

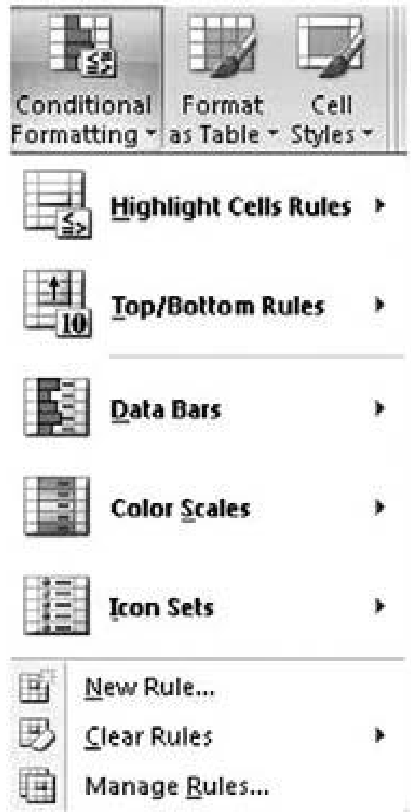


FIGURE 8.11 Excel 2007 provides multiple conditional formatting options.

There are three more options below "Highlight Cells Rules" and "Top/Bottom Rules." These provide highly specialized graphic formatting that is dependent on cell values compared to one another. Similar to "Top/Bottom" rules, these rules will change the color or create different icons depending on the values of cells in the active range.

Finally there are three options at the very bottom of the initial drop-down box. These allow a user to create a new rule from scratch, clear existing rules, or edit and manage existing rules.

ROUND

The ROUND function is a simple function that does exactly what the name implies: It rounds values to a decimal place the user enters. The entry parameters for the ROUND function are:

ROUND(value, # of decimal places)

For instance, the ROUND function is used with the following entry parameters:

=ROUND(5.244,0)

The return value for this function would be 5. This is because the function was instructed to round 5.244 to the 0 decimal place; since the tenths decimal place is 2, the value is rounded down to 5. Keep in mind that the decimal place parameter is all that matters for rounding the value preceding it.

For example, the following function is used:

=ROUND(5.499,0)

The return value for this function would still be 5, which is correct. ROUND does not first round the tenths decimal place up to 5 and then round the whole number up to 6.

9

Free Cash Flow, Terminal Value, and Discount Rates and Methods

We have built a dynamic model and discussed important sections in detail, but we have yet to consolidate our work to derive a corporate value. This chapter lays out the theory and technical implementation of deriving a corporate value. Overall, we will take an intrinsic, cash flow–based approach to determining the value. This is similar to the valuation of many financial instruments, where cash flow is projected and then discounted back to the present day to determine the present value. This *discounted cash flow* (DCF) methodology can be applied when discussing securities pricing, project valuation, and nearly any other investment opportunity valuation.

The challenge of using a DCF methodology for corporations is determining what constitutes cash flow, what the company is worth beyond the forecast period, and what discount rate(s) to use to determine the present value. Relevant cash flow calculations can be confusing because there are many sources and uses of funds. Also, perspective matters. Cash available for a debt holder is most likely different from that of an equity holder. The number of periods of cash flow we count in a forecast is also of major concern. Many company owners would suggest that their company is worth more than just the cash flows that can be spun out of the firm during the forecast period. They would suggest that there is a terminal value to a firm, since after the forecast period the firm could be liquidated, run without capital investment, or operated in perpetuity. Finally, once we understand what cash flow to count and for how long, we then need to figure out the proper rate or rates to discount the cash flows in order to obtain a present value. Figure 9.1 depicts the overall process.

FREE CASH FLOW: A MATTER OF PERSPECTIVE

Imagine a small company that is composed of only one equity holder and no debt. If that company earns just enough money to cover costs and expenses, then there are no earnings to dividend out to the equity holder or to retain to build equity value. If

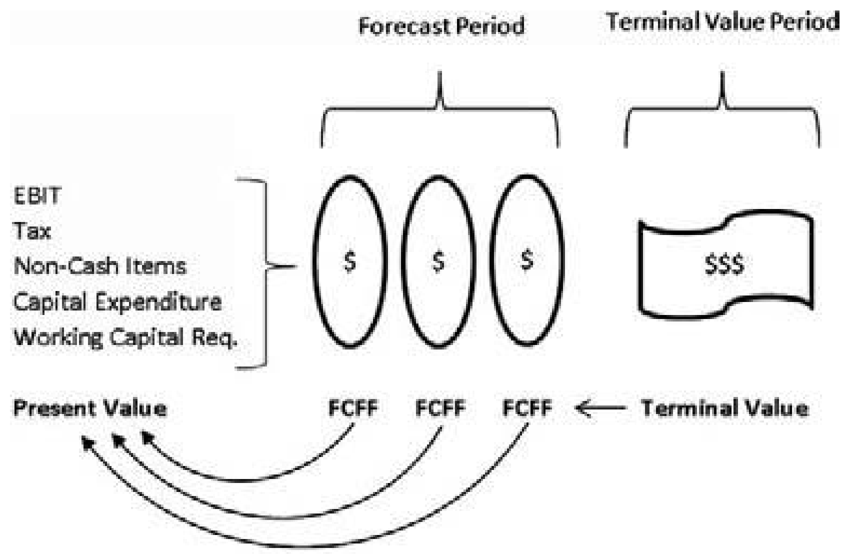


FIGURE 9.1 The DCF process requires forecast period cash flow calculations to be discounted back at appropriate rates.

this is what is expected in perpetuity, the company is worth only the invested amount to the equity holder. It may be worth the salaries the workers are earning, but from the equity holder's point of view, aside from the liquidation value of the assets, the company is worthless.

So, what is value? For the firm as a whole, meaning from the perspective of both debt and equity holders, it is any cash that is left over after meeting operating expenses, working capital needs, capital reinvestment, and taxes. Formally, this is known as *free cash flow to the firm* (FCFF). While there are a number of methods to derive FCFF, the easiest is to use the following formula, which is also represented in Figure 9.2:

$$\text{FCFF} = \text{EBIT} * (1 - \text{Tax Rate}) + \text{Non-Cash Items} - \text{Capital Expenditures} - \text{Working Capital Needs}$$

The FCFF formula often causes confusion as to what each term means, so we should go through the terminology. We start the formula with *earnings before interest and taxes* (EBIT). Some prefer to start with net income, but since FCFF also includes the perspective of debt holders it is easier to begin with EBIT. The reason it is easier is because interest payments are value to debt holders. If we start with net income, we would have to calculate and add back the after-tax interest. Instead, we could just start with EBIT and remove tax, since tax is an actual cash flow out.

The next part of the formula, *non-cash items*, is actually an addition to FCFF. This is because non-cash items are just as their name implies: not actual cash.

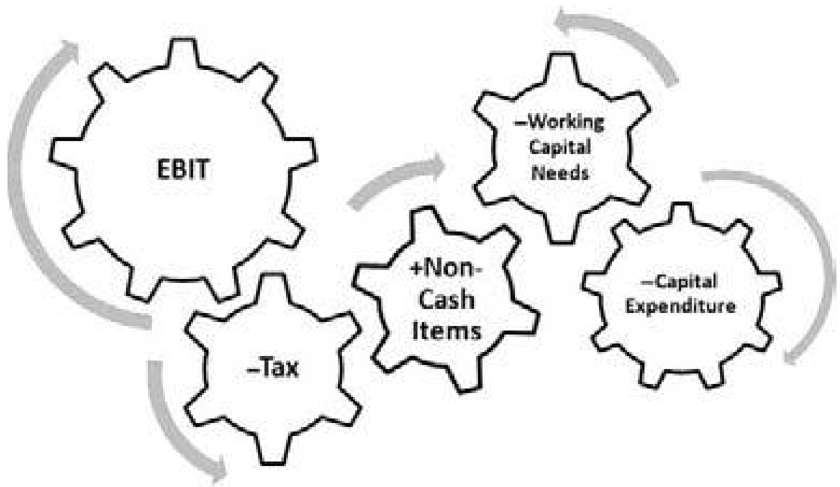


FIGURE 9.2 Free cash flow to the firm is any cash left after funding the absolute necessary cash outlays to keep the firm running.

Amounts from concepts such as *depreciation*, *amortization*, *deferred taxes*, and so on have been removed from EBIT and therefore should be added back. We have to go through this add-back process because these items have tax effects that need to be included in the EBIT calculation in order to determine the proper tax amount. Once tax is calculated, we then add back the non-cash items since they are not real cash flow.

After adding back non-cash items, we can move on to capital expenditure, which is clearly a real cash outlay. Capital expenditures are typically a necessity to keep the business generating income and therefore must be removed from any "free" cash. Similarly, if a company's business is oriented around intangibles, such as a film company, then intangible investment would be included here.

Finally, we have *working capital needs*, which is one of the most confused parts of the FCFF formula. In Chapter 8, we defined *working capital* as *current assets less current liabilities*. Working capital is critical to a business because the current assets and liabilities keep operations running on a day-to-day basis. Therefore, there should always be enough funding from current liabilities to cover the assets that are created; otherwise, we need to fund working capital from another source. The idea is similar to our balancing problem from Chapter 7. When assets were greater than liabilities, we plugged liabilities with short-term debt. When liabilities were greater than assets, we plugged assets with excess cash. If current assets are greater than current liabilities, we will have a positive working capital figure. We need to compare this to the next period's working capital in order to understand the working capital needs. If in the next period working capital increases, it means there is a need to fund it through other sources. This need therefore draws cash from our free cash flow.

Let's take a look at a simple example involving the following current asset and liability accounts over two periods:

2009	2010
Current Assets: 200	Current Assets: 500
Current Liabilities: 100	Current Liabilities: 200
Working Capital: 100	Working Capital: 300

In this data, we have a difference in working capital of 200 (2010 working capital of 300 less 2009 working capital of 100). This means that our working capital needs have increased from 2009 to 2010 and, assuming we funded 2009's working capital, we will require an additional 200 in working capital to maintain the current asset figures.

The other way to think about it is from a cash change perspective. In Chapter 8, we implemented the cash change method by examining the difference between current asset and current liability accounts each period. In the previous example, we see that current assets have increased between 2009 and 2010. An increase in assets costs cash. Think about current assets comprising solely inventory. In order to go from 200 in inventories to 500 in inventories we need to pay for 300 in raw materials, work in process, or finished goods. That's a −300 effect on cash. The opposite is true for liabilities. As they increase, we are essentially taking in cash. Think about current liabilities comprising solely short-term debt. If it went from 100 to 200, it would mean we added 100 of funding. That's a 100 effect on cash. If we sum up the cash change, we get −200.

We now have two amounts, 200 and −200, for use as the working capital component of the FCFF formula. This is exactly where the confusion lies. Either one is correct, as long as we apply it correctly. The positive 200 can be thought of as our working capital needs and should be subtracted from FCFF. Alternatively, the −200 can be thought of as the working capital cash change and should be added. Either method we choose will get us to the same FCFF answer.

While FCFF is a good indicator of cash flow to the firm, it is not representative of cash flow to an equity investor. The reason for this is that debt has priority over equity, and cash flow to debt reduces the available cash flow to equity. If we are looking at free cash flow from an equity perspective, we should instead use the following formula to derive the *free cash flow to equity* (FCFE):

$$\text{FCFE} = \text{FCFF} - \text{Interest Expense} * (1 - \text{Tax Rate}) - (\text{Principal Repayments} - \text{New Debt Issue}) - \text{Preferred Dividends}.$$

Notice in this formula the post-tax interest expense is taken away from cash available. We use post-tax figures for the interest because from an equity holder's point of view the interest is a tax shield to the company and reduces the tax liability. In addition, any principal repayments made to debt holders should be removed

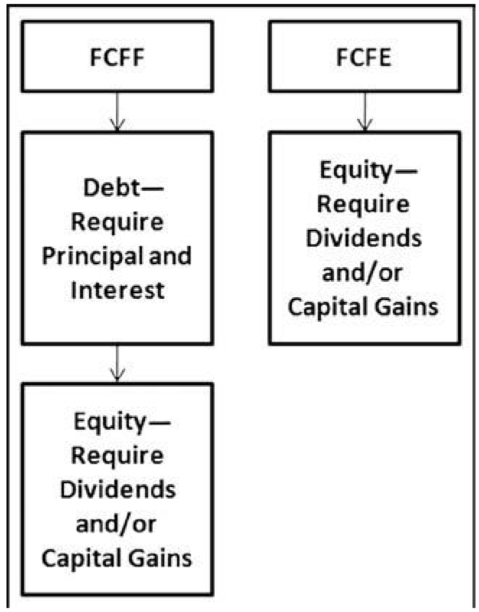


FIGURE 9.3 FCFF is cash that is spun out of the firm that can be paid to debt and equity holders, whereas FCFE is cash that can be paid to equity holders.

from the cash available to equity holders. However, if new debt is being issued, this could be available to the equity holder depending on the covenants attached to the issue. Finally, while not technically debt, preferred stock pays dividends that have a priority over common stockholders. Keep in mind that preferred dividends are often cumulative issues, and if their payment is missed one period it will have to be made up in future periods, prior to paying common shareholders. Figure 9.3 shows the difference between FCFF and FCFE.

MODEL BUILDER 9.1: IMPLEMENTING FREE CASH FLOW

1. Insert a new worksheet after the Cash Flow Statement sheet and name it **DCF**. In cell A1, enter the text **Discounted Cash Flow Valuation**.
2. Set up the dates and timing by entering the following formulas in the corresponding cells:

   E2: **=Vectors!E9**
   E3: **=Vectors!E10**

   Copy and paste these formulas over their respective rows to column Z.

3. We are going to implement FCFF in the example model and should therefore label the rows we anticipate needing for the calculation. Enter the following text in the corresponding cells:

   C5: **EBIT**
   C6: **Tax**
   C7: **EBI**
   C8: **Depreciation**
   C9: **Amortization of Intangibles**
   C10: **Change in Net Working Capital**
   C11: **Capital Expenditures**
   C12: **Free Cash Flow to the Firm**

4. EBIT is easy to find since it is directly calculated on the income statement. Enter the following formula in cell E5 on the DCF sheet:

   ='Income Statement'!E17

   Copy and paste this value over the range E5:J5.
5. Taxes need to be removed since they are real cash being paid out. To determine this amount we should reference the tax rate from the Vectors sheet. In cell E6 on the DCF sheet, enter the following formula:

   =Vectors!E31

   Copy and paste this value over the range E6:J6.
6. Just as the FCFF formula suggests, remove tax from EBIT to get the earnings before interest. Do this by entering the following formula in cell E7:

   =E5*(1-E6)

   Make sure to copy and paste this value over the range E7:J7.
7. Non-cash items are removed next. In our example model we have two non-cash items: depreciation and amortization. Enter the following formulas in the corresponding cells:

   E8: **='Income Statement'!E15**
   E9: **='Income Statement'!E16**

   Copy and paste these formulas over to column J in their respective rows. Keep in mind that we will modify the depreciation formula later in this chapter to show an optional terminal value enhancement.
8. The next row takes into account any working capital needs. Enter the following formula in cell E10:

   ='Working Capital'!E10

Copy and paste this formula over the range E9:J9. If you are referencing the completed model, you will notice that the formula is different. This is similar to step 7 since we will come back to this formula and modify it after learning about terminal value in this chapter.

9. Capital expenditures need to be removed from the free cash flow available. Enter the following formula in cell E11:

   =-Capex!E10

   Notice that since we calculated capital expenditures as positive values on the Capex sheet we need to put a negative sign in front of the reference. Identical to the previous step, capital expenditures will have a special treatment after we learn about terminal value, which will require a modification to this formula. For now, copy and paste this formula over the range E11:J11.

10. Enter the following formula in cell E12 to sum up all of the components to free cash flow:

    =SUM(E7:E11)

    The figure returned is the FCFF for the first projection period. Copy and paste the formula over the range E12:J12. Refer to Figure 9.4 for detail on what this section of the model should look like.

TERMINAL VALUE: BEYOND THE FORECAST PERIOD

One of the first numbers I turn to when auditing someone else's model is the *terminal value*. This value, which represents an estimation of the firm's value at the end of or beyond the forecast period, can have a significant impact on overall value. It is also a calculation that can be heavily distorted by poorly thought-out assumptions.

	A	B	C	D	E	F	G	H	I	J
2					Projected ---->					TV Year
3					**12/31/2008**	**12/31/2009**	**12/31/2010**	**12/31/2011**	**12/31/2012**	**12/31/2013**
4										
5			EBIT		113.40	110.54	121.02	132.15	153.59	173.73
6			Tax Rate		30%	30%	30%	30%	30%	30%
7			EBI		79.38	77.38	84.71	92.50	107.51	121.61
8			Depreciation		—	19.00	19.00	20.60	20.60	6.78
9			Amortization of Intangibles		—	3.33	5.83	7.33	1.50	—
10			Change in Net Working Capital		28.69	(20.80)	(0.09)	(0.08)	(0.07)	(0.77)
11			Capital Expenditures		(110.00)	—	(10.00)	—	—	(7.46)
12			**Free Cash Flow to Firm**		(1.93)	78.91	99.46	120.36	129.54	120.17

FIGURE 9.4 The DCF sheet first calculates the FCFF for each forecast period and for a terminal value column.

FIGURE 9.5 There are many ways to calculate a terminal value. Three of the most popular include a cash flow multiple, asset liquidation, and stable growth.

The terminal value can be calculated in a number of ways. Figure 9.5 shows an overview of the ways to calculate terminal value. The simplest ways are the ones often tossed around conference calls when people estimate the value of a firm by multiplying its last year's cash flow by an industry or market multiple. "That firm is trading at eight times EBITDA and this one is valued at ten times" is a statement akin to what you might hear. While rudimentary, this method can be applied to a terminal-year cash flow to estimate terminal value.

A more detailed method for assessing terminal value is examining the assets of the firm to see what they are worth after the forecast period. Some debt bankers might do a worst-case analysis and assume that if the company that they lent money to could not pay back or refinance debts at maturity, then as bondholders they would push for liquidation. Assessing the value of the assets versus the debt exposure is their exit strategy. Therefore, another view of terminal value in this situation is a liquidation of assets. In this case, the assets would have to be valued as if they were being sold off after the forecast period, taking into account any appreciation, depreciation, or inflation.

If a market value that far out is difficult to assess, then estimations of return value on the assets can be made. Estimating the periodic worth of the assets over the average life of the assets and discounting that stream of values to the time period at the end of the forecast period can help establish such a value.

Finally, many corporate founders and owners would shudder at the thought of breaking up their company or running it into the ground after a forecast period. Perhaps they have legitimate reasons to believe their company will continue operating and even grow beyond the forecast period. For this reason, valuation analysts began to use a *stable-growth model*. The stable-growth model assumes that a company will continue to operate and possibly grow in perpetuity. The idea is that the firm as a going concern has value. Just as the forecast period value is based on free cash flow, the stable-growth model is based on cash flow expected in perpetuity.

Formally, the stable-growth model examines a long-term cash flow expectation and takes that cash flow into perpetuity with or without a growth rate. We can formalize the stable-growth model with the following formula:

$$\text{Free Cash Flow } (t+1)/(\text{Discount Rate} - \text{Long-Term Growth Rate})$$

Quick Method	Detailed Method
FCF(final forecast period grown by LT growth)	Rebuild FCF and Possibly Adjust: Working Capital (maintenance level) Capital Expenditure (maintenance level) Depreciation (use % relationship to Capex)
Regardless of method, the stable-growth method requires the long-term assumptions for WACC and growth.	

FIGURE 9.6 A simplified approach to estimating the FCF for the terminal value can miss key differences in expectations between the short and long term. The alternative is a more detailed method that builds in long-term expectations.

In this formula, the Free Cash Flow ($t + 1$) is a free cash flow (FCF) one period after the forecast period that can be created in two ways: by growing the final forecast period's free cash flow by a long-term growth rate or by recalculating all of the components of free cash flow so they reflect the long term, in the period after the last forecast period. The first method is very easy. Simply take the last forecast free cash flow and grow it by the assumed long-term growth rate. The difference between short-term and long-term growth is one reason we have a forecast period versus a terminal value in the first place. Often, though, near-term assumptions are expected to change in the distant future. A major disadvantage of simply growing the last forecast period's free cash flow is that that free cash flow might not be representative of the expected long-term cash flows of the firm. See Figure 9.6 for more detail.

The alternative method, which addresses the flaws of the first method, is to recalculate all of the components of free cash flow to make sure they are reflective of long-term assumptions. In our example model, think about the long-term attributes of each of the items that we identified for FCFF:

- *EBIT:* In the long term, earnings are expected to grow at a long-term, stable growth rate.
- *Tax:* If the firm is expected to have a different tax regime than the one that has been assumed for the forecast period, this should be changed for the long term.
- *Non-cash items:* Non-cash items such as depreciation and amortization may have an assumption that is aggressive if there is excessive depreciation in the final forecast period due to perhaps a large capital expenditure. Conversely, if the forecast period is unusually light on capital expenditures, then the lack of depreciation taken out in perpetuity could be conservative. Overall, we need to keep in mind that the final forecast period may have an assumption that is unusual and something that will not be witnessed in perpetuity. In such a

case, with depreciation we can always turn to the industry or market to apply a comparable ratio instead of using the final forecast period's value. In the case of depreciation, it is tightly linked to capital expenditure and we should therefore use a capital-expenditure-to-depreciation ratio.

- *Capital expenditures:* Depending on the capital expenditure schedule assumed during the forecast period, the final forecast period's capital expenditure assumption could be aggressive or conservative. If capital expenditure is unusually high in the final period and we used that period's FCFF, we would be deducting a large amount from free cash flow in perpetuity. The opposite is true if there are no capital expenditures assumed for that period and we used that period's FCFF. In such a case, the free cash flow used for the terminal value would be excessively high since no capital expenditures are being removed from it. Since a company most likely needs to invest cash into capital expenditures in order to maintain or grow operational cash flow, an industry or market ratio should be used, as mentioned in the non-cash items point.
- *Working capital needs:* Similar to capital expenditures there is a base level of working capital needs as a company grows. In the forecast period we may have seen unusually high or low levels of working capital needs and should recalibrate the working capital needs expectation to an industry or market standard. Industry percentages of revenue that are tied up in working capital is a good metric to make an assumption.

Once we determine the correct numerator in the stable-growth formula, there are two very important rates required to calculate the rest of the formula. The first rate is the *discount rate*. If we are looking at a firm that is comprised of debt and equity, this rate is the *weighted average cost of capital* (WACC). If we are looking at an equity-only firm, then this rate is the *long-term cost of equity*. Keep in mind that these are long-term rates, which can be different from the forecast period rates. We will cover discount rates later in this chapter, where we will discuss the components of WACC and what needs to be taken into consideration for a long-term rate.

The final rate and assumption that is needed is the *expected long-term growth rate*. Whatever the rate by which we grew our EBIT or prior period's free cash flow, that is the rate that we should use for this part of the formula. You will quickly notice that the long-term growth rate of the firm cannot exceed the cost of capital; otherwise, a nonsensical answer will be returned.

MODEL BUILDER 9.2: CALCULATING AND INTEGRATING A STABLE-GROWTH TERMINAL VALUE

1. In our example model, we will take the more detailed route of recalculating the components of FCFF for the terminal value. While it will appear as if we were calculating another period in the forecast, this is actually just the terminal value calculation. The first part of the FCFF formula that we see is EBIT. We have taken care of this assumption by entering a long-term growth rate in the

	A	B	C	D	E	F	G	H	I	J
9		**Live Scenario**			Projected ---->					TV Year
10				**12/31/2007**	**12/31/2008**	**12/31/2009**	**12/31/2010**	**12/31/2011**	**12/31/2012**	**12/31/2013**
11		**Income Statement Items**								
12		Sales Unit Growth			5.00%	5.00%	5.00%	5.00%	5.00%	2.00%
13		Sales Price Growth			5.00%	5.00%	5.00%	5.00%	5.00%	2.00%

FIGURE 9.7 In the terminal value column (J), the long-term growth figure is used rather than the short-term growth assumption.

terminal-year assumptions. Verify that this is true by going to the Vectors sheet. The Base Case sales unit and price growth should both be set to **2.00%** as compared to 5.00% for the forecast period. Figure 9.7 shows the change from forecast period to terminal value column.

2. We will assume that the long-term tax rate does not change. The first row we encounter where there could be a change between the forecast period and the long-term outlook is depreciation. *Depreciation* is a difficult item to project in the long term on its own since it is dependent on the capital expenditure assumption, which takes into consideration the capital expenditures' lives and salvage values. We can examine history or the industry to understand this relationship and derive a common ratio known as the *capital-expenditure-to-depreciation* ratio. We will set this up in the example model and use this ratio for long-term projections. To do this, we should first assume that we have done our historical/industry analysis and established the capital-expenditure-to-depreciation ratio. Go the Assumptions sheet and enter the text **Capex to Dep**. in cell F27. Enter the value **110%** in cell G27. Name cell G27 **inputs_CapextoDep**. Refer to Figure 9.8 for detail.
3. Go back to the DCF sheet and modify the existing formula in cell J8 so that it is the following:

   =IF(J2="TV Year",-J11/inputs_CapexToDep,'Income Statement'!J15)

   Notice that this formula checks the field above the dates. In this field we created text that identifies the terminal value column ("TV Year") when the forecast period has ended. If we are in the terminal value column, then we will take the

	F	G	H	I	J	K
22	**DCF Valuation Assumptions**					
23	Forecast Beta	**1.90**		Unsec. Rating		**A**
24	LT Beta	**1.00**		Terminal Value Type		**Stable Growth**
25	Market Risk Prem.	**6.50%**		Final EBITDA Multiple		**5.00**
26	Net PPE to Net Sale:	**3%**		Global Growth Adjustor		0.00%
27	Capex to Dep.	**110%**		Long-Term Debt Ratio		**30%**
28	LT WC % of Revenue	**30%**		Long-Term Cost of Debt		**5%**

FIGURE 9.8 There are many specific assumptions involved in determining the final DCF value.

terminal value capital expenditure amount (determined in step 8 of this Model Builder) and divide it by the capital-expenditure-to-depreciation ratio. If we are in any other time period, the depreciation will be taken from the corresponding time period on the income statement. Make sure to copy and paste the formula in cell J8 over the range E8:J8.

4. The other non-cash item that we have been working with is *intangible amortization*. If intangibles are a core component of the company's operations and require periodic investment, then an assumption should be made in the long term. We are going to assume that the intangibles acquired or purchased in the forecast period were special to the forecast period, and that, in the long term, intangibles will play a minimal role. For this reason we will leave the intangible amortization row formula untouched.
5. Another item that we mentioned might change in the long term is working capital. The working capital needs may not be reflected properly in the forecast period and in our example model we are going to revert to a ratio based on net sales. To implement this, we should go back to the Assumptions sheet and enter the text **LT WC % of Revenue** in cell F28. Next, enter the value **30%** in cell G28 and name that cell **inputs_WCPctofRev**.
6. Modify the following formula on the DCF sheet in cell J10:

   =IF(J2="TV Year",-((inputs_WCPctofRev*'Income Statement'!J7)-(inputs_WCPctofRev*'Income Statement'!I7)),'Working Capital'!J10)

   Copy and paste this formula over the range E10:J10. Notice that this formula checks to see whether the current column is the terminal value year. If it is, then the working capital expected as a percentage of the current period is subtracted from the working capital expected from the prior period, using the working capital percentage of revenue assumption. Otherwise, the working capital is expected as calculated on the Working Capital sheet.
7. The next part of the terminal value FCFF is capital expenditures. As with depreciation, we may have a different expectation regarding the long-term capital expenditure assumption. Since we used the capital-expenditure-to-depreciation ratio to calculate depreciation, it would be circular to use the same ratio on depreciation to calculate capital expenditures. Aside from intimate knowledge of management plans, another method of estimating capital expenditures is by looking at a historical or industry *net PPE–to–net sales* ratio. We should create this ratio on the Assumptions sheet. Go to the Assumptions sheet and enter the text **Net PPE to Net Sales** in cell F26. Enter the value **3%** in cell G26 and name that cell **inputs_NetPPEtoNetSales**.
8. With this new ratio we should modify the formula in cell J11 to be:

   =IF(J2="TV Year",(-inputs_NetPPEtoNetSales*'Income Statement'!J7)+((-inputs_NetPPEtoNetSales*'Income Statement'!J7)/inputs_CapexToDep),-Capex!J10)

This formula checks to see whether the current column is the terminal value column. If it is, then the net PPE–to–net Sales ratio is multiplied by the current column's expected income. The result of this product is the expected net PPE. Since we are focusing on the capital expenditure for that period we should add back the expected depreciation off of that amount. We do this by adding the net PPE divided by the capital-expenditures-to-depreciation ratio, which is essentially the depreciation. This figure would actually get us to gross PPE, but since we are not assuming any historical gross PPE, we can interpret the figure as the capital expenditures. Copy and paste this formula over the range E11:J11. Figure 9.9 emphasizes the TV year section.

9. The terminal value FCFF should be automatically calculated by the existing formula in cell J12 on the DCF sheet. Notice that this value, in the example model, is significantly lower than the last forecast period's FCFF. This is due to the use of ratios to help determine the proper maintenance capital expenditures, depreciation, and working capital needs. If we had used the last forecast period's FCFF and grown it by the expected long-term growth rate, we might have created an aggressive assumption for the terminal value FCFF. This error would be compounded into perpetuity.
10. We are now prepared to calculate the terminal value. However, we may want an option on how to calculate the terminal value since there can be multiple methods. The two that we employ in the example model are a stable-growth and an EBITDA-multiple method. In order to build this functionality in we need to create a couple of options on the Assumptions sheet. On the Assumptions sheet, enter the following text in the corresponding cells:

I24: **Terminal Value Type**
I25: **Final EBITDA Multiple**

	A	B	C	D	J
2					TV Year
3					**12/31/2013**
4					
5			EBIT		173.73
6			Tax Rate		30%
7			EBI		121.61
8			Depreciation		17.65
9			Amortization of Intangibles		-
10			Change in Net Working Capital		(3.95)
11			Capital Expenditures		(19.41)
12			**Free Cash Flow to Firm**		115.90
13			**Terminal Value**		1,467.09

FIGURE 9.9 The terminal value year often requires careful thought since it is a shift from the short-term to the long-term perspective.

11. Since there can be multiple terminal value methodologies we will create a data validation list for the model user to select a method. Go to the Hidden sheet and enter the following text in the corresponding cells:

    D16: **lst_TVType**
    D17: **EBITDA Multiple**
    D18: **Stable Growth**

    Name range D17:D18 **lst_TVType**.
12. Back on the Assumptions sheet, create a data validation list in cell K24 using the named range lst_TVType as the source. Also, enter **5** as a proxy value for the EBITDA multiple in cell K25. Name cell K24 **inputs_TVType** and cell K25 **inputs_EBITDAMult**.
13. On the DCF sheet, enter the following formula in cell J13:

    =IF(J2<>"TV Year",0,IF(inputs_TVType="Stable Growth",J12/(J18-Vectors!J12),DCF!J12*inputs_EBITDAMult))

    This formula uses a conditional test that we have not yet seen. The symbols <> are synonymous with *not equal to*. Thus, if the current column is not equal to the terminal value column, then there is no terminal value calculation. Otherwise, we should have a terminal value calculation. This calculation can be based on one of the two methods we entered on the Assumptions sheet: the stable-growth method, which we have explained, or a simple EBITDA multiple that is often mentioned in conference calls.

    If a model user selects Stable Growth, then the FCFF from the terminal value column (cell J12) is divided by the long-term weighted average cost of capital (cell J17) minus the long-term growth rate from the Vectors sheet. Note that since we have not calculated the weighted average cost of capital yet, this formula will return an error if Stable Growth is selected. For now, let's assume a stable-growth method, which will be changed from an error after we cover discount rates in the next section of this chapter. Copy and paste cell J13 over the range E13:J13.
14. The final calculation we should implement is to total the FCFF and terminal value for discounting. An important concept to remember is that the terminal value is not an additional year in the timeline. Once we calculate it, we should assume it is part of the final year's forecast cash flow. Enter the following formula in cell J14:

    =IF(J2="TV Year",0,J12+K13)

    Copy and paste this formula over the range E14:J14. The first part of the formula is an IF function that tests whether the current column is the terminal value column. If this is the case, then the cash flow estimation should be done.

B	C	D	E	F	G	H	I	J
12	**Free Cash Flow to Firm**		(1.93)	78.91	99.46	120.36	129.54	115.90
13	**Terminal Value**		-	-	-	-	-	1,467.09
14	**Combined Periodic Value**		(1.93)	78.91	99.46	120.36	1,596.63	-

FIGURE 9.10 The terminal value is added to the final forecast period's free cash flow. The combined values are discounted back to the present value.

Otherwise, we should add the current period's FCFF, plus the terminal value from the next period. This effectively brings the terminal value back to the final forecast period. These combined cash flows are what we now want to discount and are shown in Figure 9.10.

DISCOUNT RATES AND METHODS

Our final requirement to determine a valuation is the rate at which we discount the FCFF and terminal value. What appears to be such a simple, singular requirement rapidly multiplies into branches of corporate finance concepts and mathematical techniques. In our example, we have focused on FCFF, which is representative of the free cash flow to the entire firm. Therefore, the rate at which we discount the cash flows should also represent the firm. To truly represent the firm's costs, such a rate must be composed of both an equity and debt cost. The costs should then be weighted by the firm's expected capital structure each period or by the capital structure that management expects. The rate that ensues from such a process is known as the *weighted average cost of capital* (WACC), as shown in Figure 9.11. To really understand the WACC, we should first delve into its major components: the cost of equity and the cost of debt.

Cost of Equity

The cost of equity is the return an equity holder would demand for offering equity funds. The theory behind this rate is derived from the *capital asset pricing model* (CAPM). Basically, an equity investor should get paid for the risk he or she takes on through investment. The return should at minimum be slightly higher than the risk-free rate in the market; otherwise, the equity investor should simply invest in risk-free securities. So, the starting place for the cost of equity is the *risk-free rate*. This is the absolute floor on the expected returns. It would be highly unlikely, though, that equity investors would accept the risk-free rate, since the firms or projects that they are investing in will have elements of risk.

CAPM suggests that investors should get paid an investment rate that is above the risk-free rate, accounts for market returns, and incorporates compensation for nondiversifiable risk. The first two are returns based on a default-free investment and

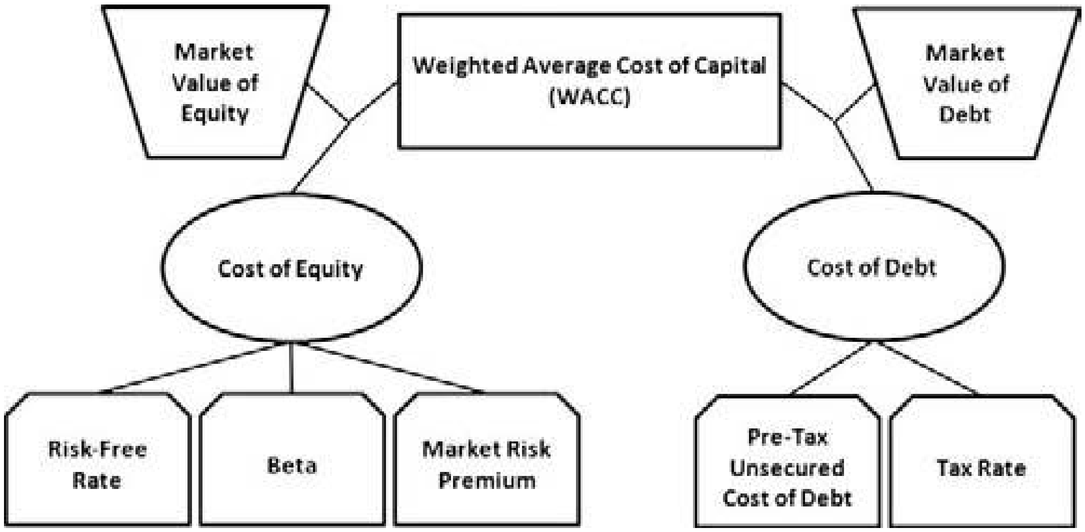


FIGURE 9.11 The weighted average cost of capital is composed of multiple factors.

the market as a whole, respectively. We will discuss them later in the chapter. To capture nondiversifiable risk we need to understand how the firm under consideration performs versus the market. Specifically, beta has been established as the metric to capture this risk and is formally defined as:

Beta = Covariance of the Firm's Returns with the Market's Returns/Variance of the Market's Returns

Beta is a metric of the firm's expected returns given the market's returns. Typically, the market is an index relevant to the firm. For many U.S. stocks, the S&P 500 is used as the benchmark.

Market risk is measured by calculating the actual returns of stocks compared to the actual returns of default-free securities (typically government securities). Be sure that the risk-free rate used to calculate the market risk premium is the same risk-free rate that is used for the risk-free rate part of the cost-of-equity calculation. Once the returns of the market and the risk-free rate are known, the difference between these two is the *market risk premium*. Both risks are shown in Figure 9.12.

We can piece together all of this information to get the formal cost-of-equity equation:

$$\text{Cost of Equity} = \text{Risk Free Rate} + \text{Beta} * \text{Market Risk Premium}$$

The only part we have not talked about is the risk-free rate. Typically, a long-dated Treasury rate, such as the 10-year Treasury, is used. In projections, this figure

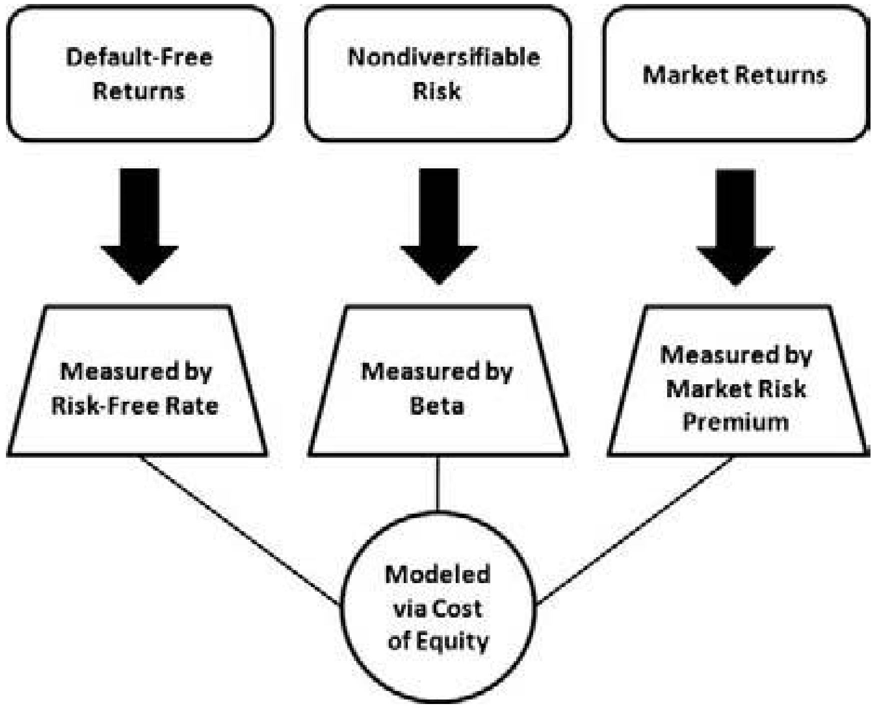


FIGURE 9.12 Beta and the market risk premium contribute to the cost of equity.

can be adjusted for inflation. We use the risk-free rate as the basis and then add the product of the firm's beta and the market risk premium.

Aside from inflation there are other considerations when forecasting these items. For beta, we should be worried about the capital structure of the firm. When a firm's capital structure changes, beta also changes. History has shown that as a firm's leverage increases, so does the volatility of a firm's returns. This means that the beta we use in one period may not be the correct beta to use in other periods. We may also assume that if a firm is in business in perpetuity, as in the stable-growth terminal value, beta stabilizes. Frequently, assumptions between 1.0 and 1.2 are used for a stable beta.

Cost of Debt

The cost of debt is simpler in calculation than the cost of equity, but equally challenging to construct properly. The cost of debt is formalized by the following equation:

$$\text{Cost of Debt} = \text{Pre-Tax Debt Interest Rate} * (1 - \text{Tax Rate})$$

Since debt interest is tax deductible, the tax-shielded portion reduces the overall cost of the debt, which is why we multiply the pre-tax debt interest rate by (1 − Tax

Rate). Note that in extreme cases the tax shield may be affected by other items, such as net loss for the year. If this is the case, the effective tax rate could be lowered and the benefit from an interest tax shield diminished.

Determining the pre-tax debt interest rate is more challenging. For a publicly rated company this rate is usually tied to the creditworthiness of the firm. Rating agencies such as Moody's, Standard & Poor's, and Fitch provide ratings of companies based on credit analysis. This credit analysis often involves assessing the company's expected cash flow vis-à-vis its capital structure. Submetrics can include interest and debt service coverage ratios, quick ratios, liquidity ratios, and so on. Industry and market analyses and the company's ability to respond to them under various stress scenarios are also factored into the ratings decision.

Once a company is rated, its debt tends to price close to other similarly rated entities. For instance, using Standard & Poor's scale we could say that two A-rated firms would pay similar spreads over LIBOR. As a financial modeler, one can use the existing debt market prices to help price our example company's debt. A challenge we may encounter is that our financial model is a projection over time, particularly the forecast period. Over time, a company's ratings can change either up or down. To account for this, advanced work can be done to estimate rating changes. This is done by creating transition matrices, which are sets of probabilities of possible ratings upgrades or downgrades from a preexisting state. These transition matrices allow an analyst to simulate credit risk fluctuations of a firm. As the expected rating of the firm changes, so does the pre-tax debt interest rate.

For private companies this analysis can be difficult, but not impossible. The default risk of a private company can be estimated by examining the historical assets versus the liabilities of the firm. We can create probabilities of the asset/liability ratio changing based on history and simulate that ratio going forward. If that ratio drops below one, or in some cases below a certain threshold below one, we can assume that the company is defaulted. If we simulated this many, many times we could get a default probability for the firm and try to link that to a historical rating of companies in the same or related industry. We can then use the market spreads for the determined rating.

Capital Structure Effects on WACC

Calculating the cost of equity and cost of debt is only half of the work. By name alone, the WACC implies that we weight each of these rates by certain amounts. Theory suggests that the proper weights are the market values of equity and debt. The market value of equity is easy as it is the current stock price multiplied by the shares outstanding. The market value of debt is more challenging since we would need to discount the debt at the appropriate yield. Further complicating matters is that in a projection model we would need to project these yields in the future. For these reasons, many assume the book value of debt instead.

MODEL BUILDER 9.3: CALCULATING AND IMPLEMENTING THE WEIGHTED AVERAGE COST OF CAPITAL

1. In order to calculate the WACC for any period, we should have the necessary assumptions for the cost of equity and debt. Starting with the cost of equity, we require the risk-free rate, beta, and the market risk premium. We will assume the risk-free rate each period is from our 10Y U.S. Treasury rate assumption on the Vectors sheet. Beta and the market risk premium are necessary inputs that we have yet to enter. Go to the Assumptions sheet and enter the following text and values in the corresponding cells:

   F23: **Forecast Beta**
   F24: **LT Beta**
   F25: **Market Risk Prem.**
   G23: **1.9**
   G24: **1.0**
   G25: **6.5%**

   Name cell G23 **inputs_Beta**, cell G24 **inputs_LTBeta**, and cell G25 **inputs_RiskPrem**. Notice that we have a forecast period beta and a separate, more stable long-term assumption for beta.
2. Go to the DCF sheet and enter the text **Cost of Equity** in cell C17. In cell E16, enter the following formula:

   =IF(E2="TV Year",Vectors!E34+(inputs_LTBeta*inputs_RiskPrem),Vectors!E34+(inputs_Beta*inputs_RiskPrem))

   This formula checks to see whether the current column is the terminal value column. If it is, then the risk-free rate from the Vectors sheet is added to the long-term beta multiplied by the market risk premium. Otherwise, we are in a forecast period and the risk-free rate from the Vectors sheet is added to the forecast period beta multiplied by the market risk premium. We could get more specific and create beta assumptions for each forecast period if we believe the risk profile or the capital structure of the company is going to change over that time span. Remember to copy and paste the formula over the range E17:J17.
3. Next we will complete the cost of debt. We should note the current rating of the firm on the Assumptions sheet, even though the example model does not have a table of ratings and spreads. On the Assumptions sheet, enter the text **Unsec. Rating** in cell L23. Enter the text **A** in cell K23. This means that we are assuming the firm is an A-rated entity according to Standard & Poor's. We assume that this is the unsecured risk rating of the firm. Be very careful when looking up ratings on companies since secured ratings can be higher because they are backed by assets and do not represent the true credit risk of the firm.

4. If we simplify our assumption and compute the book cost of debt, we need to know each debt's rate and the balance each period. Remember that in theory we should be using market value instead of book value, but in the example model we will use book value. Most of the values for debt are already prepared for us, except short-term debt. Earlier we referenced the Vectors sheet to calculate interest amounts, but never explicitly calculated the short-term debt rate in a different cell. We should do this to assist in the cost-of-debt calculation. On the DCF sheet, enter the text **Cost of ST Debt** in cell C15. Then enter the following formula in cell E15:

   =IF(AVERAGE('Balance Sheet'!D31:E31)<inputs_Precision,0,'Income Statement'!E28/AVERAGE('Balance Sheet'!D31:E31))

   This formula backs out the implied interest rate, based on the interest from short-term interest divided by the average balance. Copy and paste this formula over the range E15:J15.
5. Prior to calculating the cost of debt we have to consider the terminal value period. Since we will be using the book value of debt as a proxy and using the rates estimated from that debt for the cost of debt, the long-term debt rate is unknown. We can research this figure and estimate it. Let's assume that the long-term debt rate is 5.00% by entering that value on the Assumptions sheet in cell K28. Name that cell **inputs_LTCostofD**. Also, create a label in cell I28 by entering the text **Long-Term Cost of Debt**.
6. We are now ready to compute the cost of debt. First create a label on the DCF sheet by entering the text **Cost of Debt** in cell C16. Next enter the following formula in cell E16:

   =IF(E2="TV Year",inputs_LTCostofD,IF(SUM('Balance Sheet'!D31,'Balance Sheet'!E35)<=inputs_Precision,0,((E15*AVERAGE('Balance Sheet'!D31:E31)+(Debt!E16*Debt!D53)+(Debt!E26*Debt!D54)+(Debt!D36*Debt!D55))/(SUM(Debt!D53:D55)+AVERAGE('Balance Sheet'!D31:E31)))*(1-E6)))

   What appears to be a complex formula is really just calculating a weighted average. The first check is to see whether the current period is the terminal value period. If this is the case, we may have to have an assumption for the cost of debt in the long term. This assumption was created on the Assumptions sheet. The next check is to see whether there is any debt on the balance sheet. If there is not, then there is no need to calculate any further and the cost of debt is 0. If there is debt, though, the first influence could be short-term debt, which uses a multiperiod balance since we are unclear as to exactly when the debt came on the books. Otherwise, the long-term debt is taken at the end-of-period balance for the prior period, multiplied by each issuance's respective rate. Dividing all of these products by the balances produces the *weighted average pre-tax cost of debt*. We then remove the tax rate to get to the *after-tax* cost of debt. Copy and paste this formula over the range E16:J16.

7. We are almost ready to calculate the WACC, but as in step 5 we have to consider another change of assumptions for debt in the terminal value period. An issue that we might have with a projection is that the capital structure changes as the planned debt amortizes. In the long term, management may have an expected capital structure that they plan to adhere to. If this is the case, we may need to reweight the capital structure in the terminal value period to reflect this expectation. On the Assumptions sheet, enter the text **Long-Term Debt Ratio** in cell I27. In cell K27, enter the value **30%**. Name cell I27 **inputs_LTDebtRatio**.
8. The final step is to get the WACC by weighting the cost of debt and the cost of equity by the debt and equity values each period. Enter the text **WACC** in cell C18 and in cell E18 enter the following formula:

   =IF(E2="TV Year",(E16*inputs_LTDebtRatio)+(E17*(1-inputs_LTDebt Ratio)),((E16*('Balance Sheet'!D35+AVERAGE('Balance Sheet'! D31:E31)))+(E17*'Balance Sheet'!D43))/SUM(AVERAGE('Balance Sheet'! D31:E31),'Balance Sheet'!D35,'Balance Sheet'!D43))

   This formula first tests to see whether the current period is the terminal value period. If this is the case. then the long-term debt ratio is used as the weight plus the cost of equity multiplied by one minus the long-term debt ratio. Otherwise, the cost of debt is multiplied by the total debt outstanding at the time period and added to the cost of equity multiplied by the outstanding equity. A consideration with this formula is that the debt and equity amounts are taken from the prior period, which assumes that their increase comes toward the end of the period. This is consistent with the issue date of the debt and an assumption for the equity values. If the balances are assumed to come in at different periods, this formula should be adjusted accordingly. The sum of these products is then divided by the sum of the debt and equity balances to produce the WACC. Copy and paste this formula over the range E18:J18. Figure 9.13 shows how the DCF sheet should develop.

	C	E	F	G	H	I	J
15	Cost of ST Debt	5.35%	5.35%	0.00%	0.00%	0.00%	0.00%
16	Cost of Debt	0.00%	4.49%	4.71%	4.71%	4.73%	5.00%
17	Cost of Equity	15.35%	15.85%	16.35%	16.85%	17.35%	12.00%
18	WACC	14.17%	13.69%	15.26%	16.21%	17.04%	9.90%
19	**Cumulative Discount Value**	979.39	1,120.13	1,194.60	1,277.47	1,364.16	

FIGURE 9.13 The cost of equity and debt can be approximated in the model and used to create the WACC.

	B	C	D	E	F	G	H	I
19		**Cumulative Discount Value**		979.39	1,120.13	1,194.60	1,277.47	1,364.16
20								
21			Firm Value (Present Value)		$	979.39		

FIGURE 9.14 When discounting with multiple rates, we cannot just use the present value function and reference the rate and future value. This will blend the discount rates over time. We must bring the values back one period at a time until we reach the current period.

Time Value of Money and Discounting

Most corporate finance professionals are familiar with the core tenet of *time value of money*, where money in the present is worth more than money in the future. Any cash flow in the future needs to be discounted to the present value in order to make valid comparisons or decisions today. The mathematics behind discounting is relatively easy and made even easier with Excel. These calculations and functions are discussed at the end of this chapter in the Toolbox. The challenge for a financial modeler is determining the correct cash flow and discount rate(s), which is why we spent the majority of this chapter focusing on the cash flow and discount rates. The only part we need to discuss is the commonly confused method of discounting with multiple discount rates.

An error that permeates many discounted cash flow models with changing discount rates is overusing each discount rate. Let's just use a simple two-period example. Assume the discount rate in period 1 is 5.0% and the cash flow 100, while the discount rate is period 2 is 6.0% and the cash flow 200. In theory, to get a value we should discount these rates to the present value and sum up the discounted amounts. However, some analysts discount the period 2 cash flow (200) at 6.0% for two periods and the period 1 cash flow (100) at 5.0% for one period. This is incorrect since the period 2 cash flow should be discounted only for one period at 6.0% and then at 5.0% for the next cash flow. Figure 9.14 shows the difference in results between the correct and incorrect methods.

MODEL BUILDER 9.4: DISCOUNTING WITH MULTIPLE RATES TO DETERMINE THE CORPORATE VALUE

1. Go the DCF sheet and enter the text **Cumulative Discount Value** in cell C19. This row will contain the cumulative discount value, one period back for each period. This will allow us to use multiple discount rates correctly. In cell E19, enter the following formula:

   =(E14+F19)/(1+E18)^1

H19 f_x =(H14+I19)/(1+H18)^1

	B	C	D	E	F	G	H	I	J
15		Cost of ST Debt		5.35%	5.35%	0.00%	0.00%	0.00%	0.00%
16		Cost of Debt		0.00%	4.49%	4.71%	4.71%	4.73%	5.00%
17		Cost of Equity		15.35%	15.85%	16.35%	16.85%	17.35%	12.00%
18		WACC		14.17%	13.69%	15.26%	16.21%	17.04%	9.90%
19		**Cumulative Discount Value**		979.39	1,120.13	1,194.60	1,277.47	1,364.16	

FIGURE 9.15 Given the changing discount rates, we must use a custom formula to discount the cash flows to derive the firm value.

This formula takes the current period's cash flow, plus the next period's cash flow, and discounts the combined value back one period. Ultimately, the value in cell E19 is today's present value of the corporation. If the formula for discounting with multiple discount rates is unclear, refer to the Toolbox at the end of this chapter.

2. To make the firm value clear, enter the text **Firm Value** (**Present Value**) in cell E21 on the DCF sheet. Next, enter the following formula in cell G21:

   =E19

   Name cell G21 **outputs_FirmValue**. The new section to the DCF sheet is shown in Figure 9.15.

AFTER THE CORPORATE VALUATION

Although we have achieved our goal of determining a corporate value given a multitude of assumptions, we should realize there is a bit more to accomplish. Just as we stated in Chapter 1, a good financial modeler does not stop simply at the result, but puts time into explaining the result and understanding risk. To assist in this process, we need to create outputs that are intelligible, easy to understand, and quick to work with in Excel. Similarly, we may want to access the power of Visual Basic Applications (VBA) to eliminate circular references, automate scenario generation, and print sheets in bulk. Chapter 10 focuses on output reporting, and Chapter 11 provides a primer to VBA, useful code for discounted cash flow models, and a thorough explanation of each line of code.

TOOLBOX

Weighted Averages Using SUMPRODUCT and SUM

In the Model Builders in this chapter, we had to calculate weighted averages multiple times. While our example model has a number of items that are spread out over

Cost of Debt	0.08
Cost of Equity	0.14
Market Value of Debt	6540
Market Value of Equity	3200

FIGURE 9.16 In this example, we will create the WACC quickly from the cost of debt, cost of equity, market value of debt, and market value of equity.

separate sections, making the weighted average calculation challenging, a standard weighted average where the elements of the average are aligned is very easy to calculate in Excel. Imagine having the cost of debt, cost of equity, market value of debt, and market value of equity as seen in Figure 9.16.

With this data set, the values to which we want to apply a weighted average are the cost rates, weighted by the market values. You will not find a prebuilt weighted average function in Excel, but the closest we can get without creating our own user-defined function is using SUMPRODUCT and SUM in combination.

SUMPRODUCT is a mathematical function that takes the following entry parameters:

SUMPRODUCT(array 1, array 2. . .)

Multiple, equal-size arrays can be referenced as array 1, array 2, and so on. The function multiplies each respective value in each array, meaning that in a two-array example the first value in array 1 would be multiplied by the first value in array 2, the second value in array 1 would be multiplied by the second value in array 2, and so on. All of the products are then summed up to produce the final result.

Most understand the SUM function, so all that is left is how we use these two functions in combination. A simplified formula that can help us remember how to calculate the weighted average is to take the SUMPRODUCT of the values and weights and divide by the sum of the weights. Going back to our example earlier, with the cost of debt, cost of equity, market value of debt, and market value of equity, we can calculate the WACC by using the SUMPRODUCT function on the rate array and the market value array. In the same formula, we use the SUM function on the market value array. Figure 9.17 shows the complete calculation.

Present Value Functions: PV, NPV, XNPV

PV Excel has multiple time-value-of-money functions built in; however, there are nuances to each one that require the user to put some thought into them to get

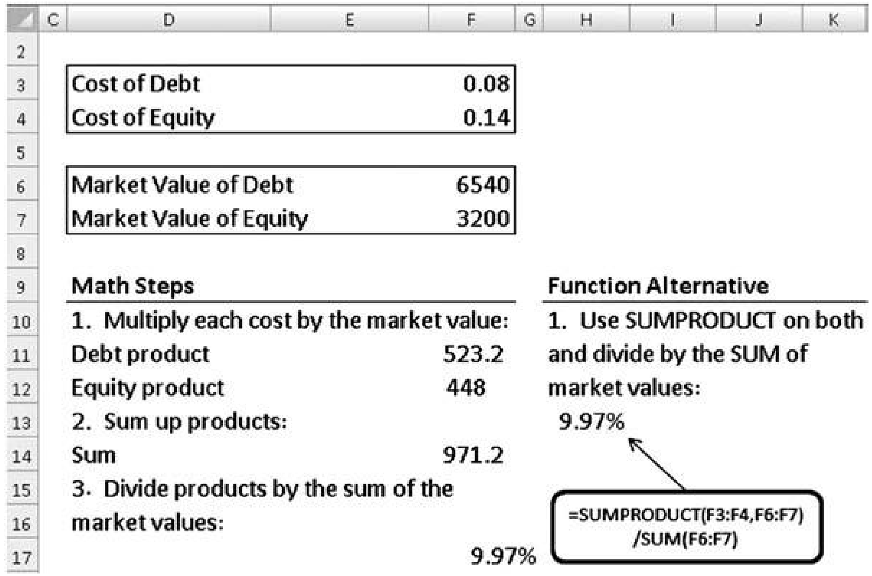
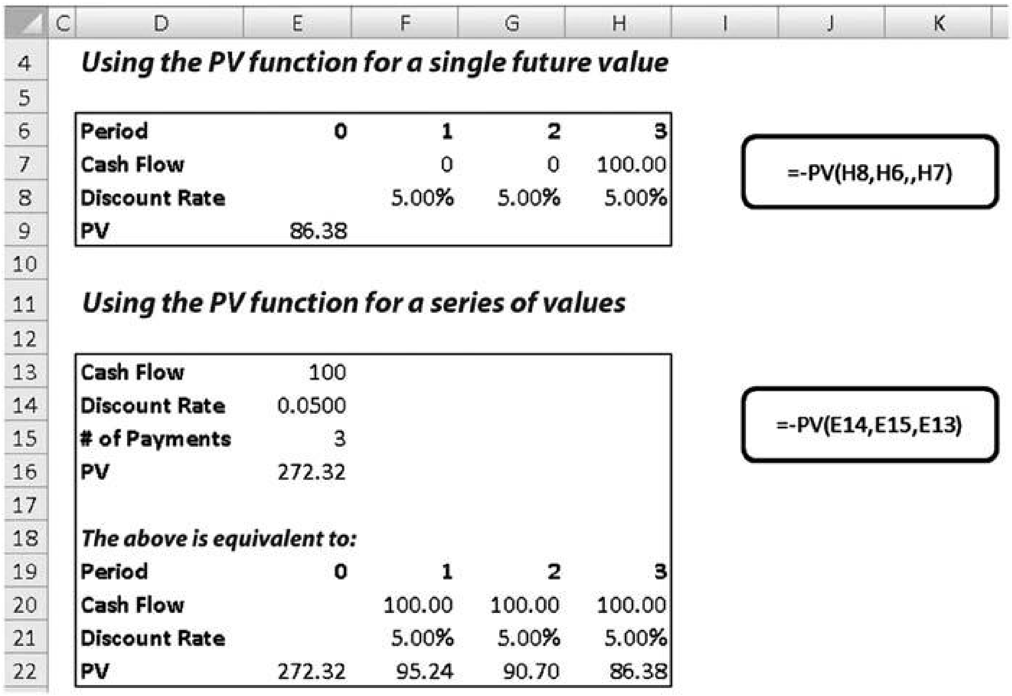


FIGURE 9.17 Although we could calculate the WACC using mathematical formulas, SUMPRODUCT and SUM work well together to calculate a weighted average quickly.

the correct return value. The first function that we will examine in detail is the PV function. The PV function calculates the present value of a future cash flow or a fixed series of cash flows. The entry parameters for the PV function include:

> PV(Discount Rate, Number of Periods, Payment, Future Value, Cash Flow at End of Period or Beginning)

The discount rate is the first entry that is absolute necessary. This rate should correspond to the periodicity of the discount periods (e.g., if the discount periods are annual, then the rate should be per annum). Before we explain the next few parameters, we should understand that the PV function can be used in two ways: to derive the present value of a cash flow at a point in time or to derive the present value of a series of cash flows. Given the flexibility of this function to do either calculation, the second entry parameter is either the number of periods in the future the single cash flow is generated or the number of periods in the future series of cash flows. The third entry parameter is only in the case of using the PV function with a series of cash flows. This entry parameter is the cash flow that is assumed to be generated each period for the number of periods assumed in the second entry parameter. If the PV function is being used to calculate a present value based only on a single future value, the payment should be left blank and a comma inserted to move on to the fourth entry parameter. The fourth entry parameter is if the PV function is being used with a single future value. This entry parameter is the future value that is being



Using the PV function for a single future value

Period	0	1	2	3
Cash Flow		0	0	100.00
Discount Rate		5.00%	5.00%	5.00%
PV	86.38			

=-PV(H8,H6,,H7)

Using the PV function for a series of values

Cash Flow	100
Discount Rate	0.0500
# of Payments	3
PV	272.32

=-PV(E14,E15,E13)

The above is equivalent to:

Period	0	1	2	3
Cash Flow		100.00	100.00	100.00
Discount Rate		5.00%	5.00%	5.00%
PV	272.32	95.24	90.70	86.38

FIGURE 9.18 Care should be taken when using the PV function since it can be used in multiple ways.

discounted. Finally, regardless of whether the PV function is being used with a series of cash flows or a single future value, the last entry parameter sets whether the cash flow is assumed to come at the end of the period or at the beginning of the period. Most likely this is omitted, which sets the function to end-of-period calculation.

Figure 9.18 shows an example of how the PV function is used in different ways. The first way shown is a single future value of 100, discounted over three periods at 5.0%. The second way is a payment of 100 for three periods, discounted at 5.0%.

NPV The next function that we will examine is NPV, which stands for *net present value*. The name itself implies that a net value will be determined from a gross value, which is one way to use the function. Unfortunately, due to preprogrammed timing, this function is often used incorrectly. Let's first examine how financial modelers tend to use the function correctly.

Many financial modelers take advantage of the NPV function's ability to accept multiple cash flows. The entry parameters for NPV are:

NPV(Discount Rate, Array of Cash Flows to Be Discounted)

An easy example is shown in Figure 9.19, where a bond's cash flows are being discounted at 6.0%. Instead of calculating each period's present value and summing

	A	B	C	D	E	F
1	***NPV***					
2						
3						
4		**Period**	**0**	**1**	**2**	**3**
5		Interest		50	50	50
6		Principal				1000
7		Combined CFs	0	50	50	1050
8						
9		Market Rate	0.05			
10		Present Value	=npv(C9,D7:F7)			

FIGURE 9.19 The NPV function is quick to use for single discount rate, equal-interval problems.

them up, the NPV function provides this for us. In such an example, the NPV function is being used to calculate the gross present value since no cost assumption was entered. It's when we begin to use the NPV function to determine that net present value that we run into errors. To help this, we should identify the two most common errors created when using NPV, the second of which involves periodicity:

1. The first cash flow referenced is assumed to be one period from today. While this is fine with the previous bond example, the error that could occur is when we try using the cost of the bond in the calculation. Many people would put a −1000 for time period 0 and then use the NPV function, referencing the cost as the first cell in the entry array. The problem with this is that the first entry is assumed to be one period from today, even if it is negative. This means that the negative value will be discounted one period. In most cases we are assuming that the cost takes place today, not one period from today.
2. Since we didn't provide Excel with any information regarding the time between each period, Excel must assume that these time periods are equal. In cases where the periods between cash flows are uneven the NPV function will return the incorrect value. This is often the case when a project or funding closes on a specific date and the next period is an uneven amount of time from the closing date.

XNPV To overcome the limitations of the NPV function in regard to periodicity, Excel's designers created the XNPV function. This function is similar to the NPV function; however, it uses exact dates rather than assuming equal amounts of time between periods. The entry parameters for the XNPV function include:

XNPV(Discount Rate, Array of Cash Flows to Be Discounted, Dates Corresponding to Each Cash Flow)

The XNPV function is very similar to NPV in that it references multiple cash flows and calculates a present value with a single discount rate. The added functionality is that we can assign dates to each cash flow by referencing a corresponding set of dates. While this may seem to be a minor difference, there are actually a couple of considerations that we need to make regarding this function:

1. The first cash flow entry in the XNPV function is assumed to be the present value, regardless of the date that corresponds to it. This is very different from the NPV function where the first value is assumed to take place one period from the present.
2. The XNPV function is not standard on Excel 2003 or earlier and is activated only once the Analysis Tool Pak is added in. Even after this Tool Pak is added in, the function does not provide automatic parameter entry prompts like many other functions.

Discounting Process with Multiple Rates

Even with all of the present value functions that Excel has built in, there is still a lack of a function to discount multiple cash flows at different rates. Currently, the best way to accomplish this is mathematically, by building our own formula. Let us assume we have a series of three cash flows in three future periods with three different discount rates. The best way to learn how this process works is by thinking in terms of being transported in time to the second discount period and trying to determine the present value of the cash flows in that period. That calculation would discount the third period's cash flow back one period at the third period's discount rate. We would also add the second period's cash flow, giving us the total present value as of period 2.

Now imagine going back in time one period to period 1. To calculate the present value as of that period, we would take the present value we calculated in period 2 and discount it one period at the period 2 discount rate to get the present value as of period 1. We have to remember to add the cash flow from period 1 to derive the period 1 present value. If we were to repeat this process one more time we would have today's present value. Figure 9.20 shows this process and the formula that consolidates the calculations.

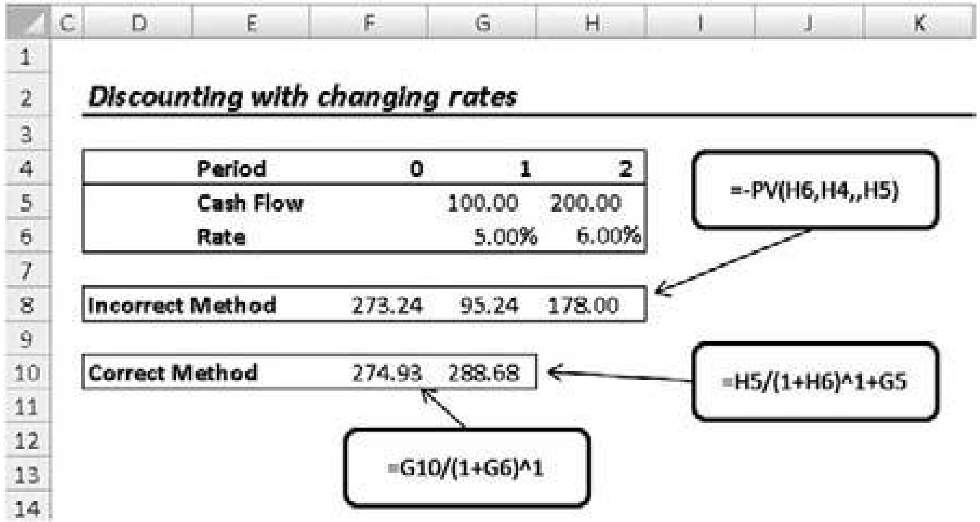


FIGURE 9.20 Discounting with multiple discount rates requires special consideration and a formula that is not part of a preprogrammed function.

COVAR, VAR, and VARP for Beta Calculation

In this chapter, we discussed the concept of beta, but did not go into its calculation. *Beta* is an attempt to capture non-diversifiable risk. It is done by historically analyzing the returns of a company versus a market index. In the case of U.S. companies, the S&P 500 is frequently used. The comparison that is actually done is examining the covariance of the company's returns and the market index's returns, while controlling for the variance of the market index's returns. This is formalized in the following equation:

Beta = Covariance of Company Returns and Market Index Returns/Variance of the Market Index Returns

We can quickly calculate this formula in Excel using prebuilt functions. The first function to learn is COVAR, which stands for *covariance*. The entry parameters for COVAR are:

COVAR(first range of data, second range of data)

For our beta example, the first range of data is the company's returns and the second range of data is the market index returns. Note that the order of range entry does not matter. Calculating the covariance is not like a regression, where we are concerned with dependency. Covariance is just quantifying how two data sets move together.

Two other functions can help us with the denominator in the beta equation: VAR and VARP. Both VAR and VARP calculate the variance of a data set. The entry parameters are any set of data in Excel. The key difference between the two functions is that VAR calculates a sample variance, while VARP calculates a population variance. Variance of a sample is calculated by the following formula:

SUM((each individual data point − mean of all data points)^2)/(number of data points − 1)

Variance of a population is calculated by:

SUM((each individual data point − mean of all data points)^2)/number of data points

In the case of calculating beta, we are assuming the market index represents a population and should therefore use the following Excel-based formula:

COVAR(stock returns, market index returns)/VARP(market index returns)

10
Output Reporting

Disappointing situations to witness with financial modelers is when they have built an elegant, mathematically correct model, but fail to set up a system for explaining results. These situations cause confusion among analysts who must interpret model results. Even worse are ensuing perceptions of skepticism toward a model that is difficult to understand, often rendering the model useless. To mitigate against such a circumstance, we implement a strong output reporting system to explain our results.

A good reporting system organizes core assumptions, analytical results, and financial metrics in an easy-to-read format. While our financial model may have created formulas to optimize calculation, the output reporting optimizes understanding. An example of this difference is decimal places. Throughout our example model we used numbers without regard to the place value. Although the calculations work well, the readability is impaired because it is difficult to understand the actual values of the results. The output reporting system should make this clear.

Further, we might want graphical representations of results. These are easily created in Excel by using the Chart functionality. We can then enhance these charts with tools that allow us to quickly change the data in a graphical way. Also, to ease the updating of pertinent information, we might also want to tap into Excel's ability to connect to other data sources, such as the Internet.

OUTPUT SUMMARY

In order to explain results, it is useful to create a separate section in the model, known as the Output Summary, that organizes and formats key information. The primary sections of an Output Summary for a corporate entity should include:

- *Descriptive characteristics:* stock ticker, stock price information, important dates and timing, capital structure parameters, industry/market ratios, and cash flow priority settings.
- *Financial statements:* income statement, balance sheet, and cash flow statement
- *Key rates and ratios:* growth rate(s), interest rates, and important ratios such as interest and debt service coverage

An important concept to keep in mind is that the Output Summary should not contain *any* hard-coded values. The entire Output Summary should be automated and controlled by the other sheets in the model. This will prevent any error between scenarios, where assumptions are changing.

MODEL BUILDER 10.1: PREPARING FOR THE OUTPUT SUMMARY SHEET

1. Prior to actually creating the Output Summary sheet, there are a number of preparations in the example model that are necessary. The first is to set the units. Currently, we do not know the units in the model. For all we know, the values could be in terms of billions. To make this clear, we will create a data validation list that allows the user to select the units for all of the figures. Go to the Hidden sheet, and enter the following text in the corresponding cells:

   D6: **lst_Units**
   D7: **Hundreds**
   D8: **Thousands**
   D9: **Millions**
   D10: **Billions**

   Name the range D7:D10 **lst_Units**.
2. For each unit description, we want to create a multiplier for entered values so that on the Output Summary the numbers are clear. Still on the Hidden sheet, enter the following values in the corresponding cells:

   E7: **100**
   E8: **1000**
   E9: **1000000**
   E10: **1000000000**

   On the Assumptions sheet, enter the text **Units** in cell B13. Then, create a data validation list in cell D13 using the named range lst_Units as the source. When we create the Output Summary in Model Builder 10.3, the model user will be able to select the units, which will cause the Output Summary values to be multiplied by the associated unit value on the Hidden sheet. Thus far, the new section on the Hidden sheet should look like Figure 10.1.

WEB DOWNLOADS

Obtaining information is often a time-consuming process. If the information that we are obtaining is organized in a consistent manner from a reputable source, we

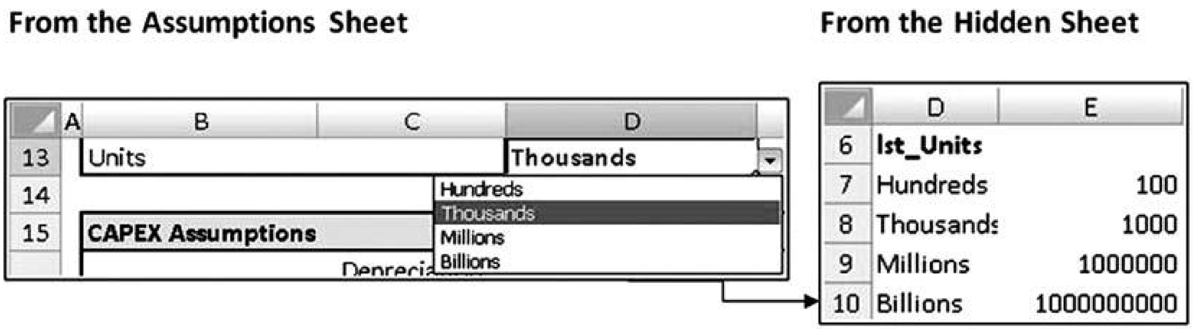


FIGURE 10.1 Assumptions regarding units will control the look of the Output Summary via the Hidden sheet.

can hook up Excel into that source so the information is automatically downloaded. Excel can connect to multiple external data sources:

- Microsoft access databases
- Text files, primarily converting .txt or .csv
- The Web
- SQL servers
- XML files
- Custom in-house databases, often using additional programs such as Hyperion EssBase
- Custom external databases, such as Bloomberg (common to finance)

While many of the database connections are useful for finance applications, most financial analysts will get the most use out of connecting to the Web. Stock information, interest rates, and currency exchange rates can be automatically downloaded from web sources and used in financial models.

Beyond understanding the external data features Excel provides, it is important to learn how to optimally implement these connections. Often, information downloaded from external sources is imported in a raw, unrefined format. In order to control for the possible mess that external data connections can cause within a model, the information should be downloaded to a separate sheet, which can be later hidden, and cleaned up with a number of useful Excel functions.

MODEL BUILDER 10.2: CONNECTING THE EXAMPLE MODEL TO THE WEB

1. Useful data for the Output Summary can come straight from the Web. To manage the information from the Web, we will create a separate sheet. Insert a

FIGURE 10.2 External data such as that from the Web is downloadable via the Data tab.

worksheet after the Hidden sheet and name it **Web Downloads**. Enter the text **Web Downloads** in cell A1 of the new sheet.

2. In cell B3, enter the text **Stock Information**. This is where we will create a web query in order to automatically download information from the Web. Accessing Excel's external data depends on which version of Excel is being used:
   - *For Excel 2007*: Go to the **Data** tab on the ribbon. On the far left there should be a button called "Get External Data." Select **From the Web**. This will open what looks like a web browser. Go to step 3 of this Model Builder to continue with the web download process. This selection is shown in Figure 10.2.
   - *For Excel 2003 and earlier*: Go to the **Data** menu, select **Import External Data**, and then select **New Web Query**. This will open the same web browser window as in Excel 2007.
3. Note that you must be connected to the Internet for this function to work, regardless of whether you are in Excel 2007 or Excel 2003 or earlier; otherwise, the web browser–looking box will have an error in it. If you are connected to the Internet, the web browser–looking box should automatically navigate to your home page. When this box is open you can navigate to any page that you like.

   You will notice there are little arrows throughout each web page. These arrows mark information that is organized in a table format that can be downloaded to Excel. By clicking once on these labels you should see the arrow turn blue, along with a blue border around the table. The data within the blue border will be imported into Excel. While the color will not show, the dialogue box is shown in Figure 10.3.

   For this example we will navigate to www.finance.yahoo.com. On that web page, enter the stock ticker **SMP** in the appropriate field, purely as an example (the example model is not set up to represent SMP's valuation). Left-click on the little arrow next to the stock information that includes last price, 52-week-high, 52-week-low, and so on. Select two tables. Next, click on the

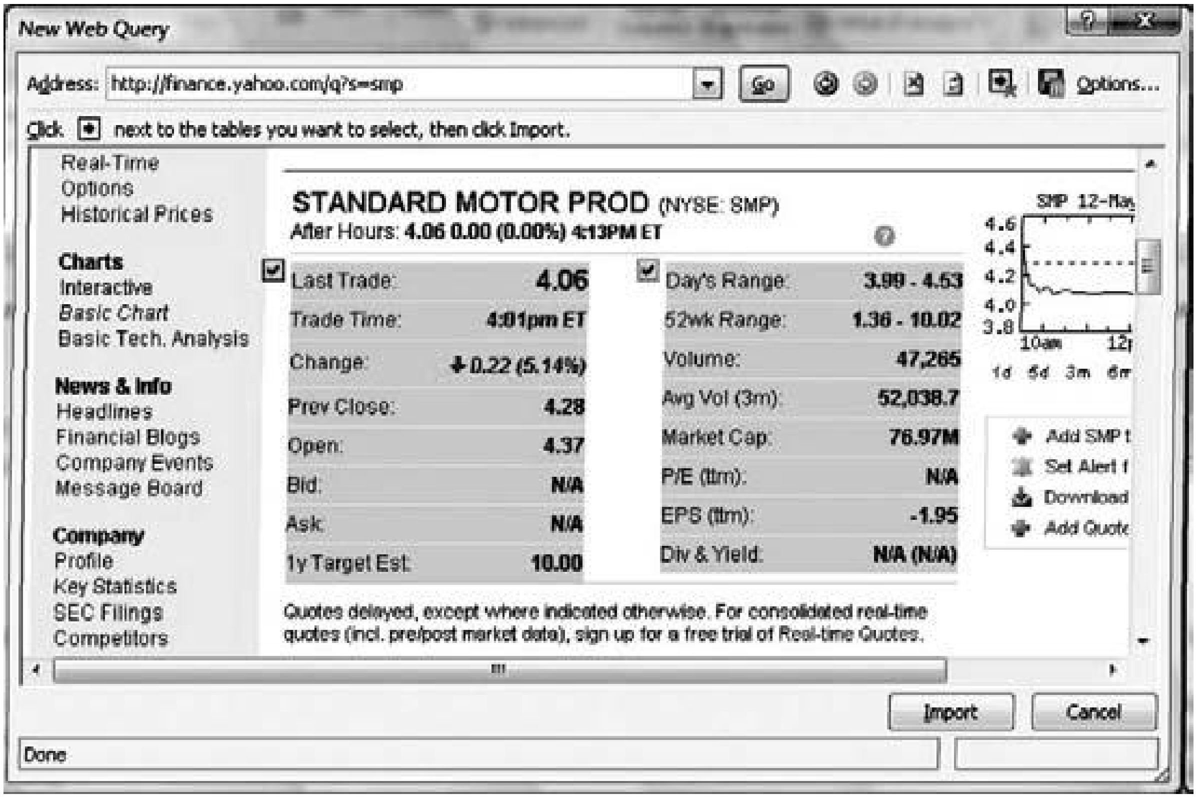


FIGURE 10.3 The Web query dialogue box allows you to quickly import data from the Web.

Import button on the bottom-right of the web browser–looking box. Excel will then prompt you with another dialogue box, asking where you would like to import the information. Select **Existing Worksheet**, and enter cell **B4** as the cell where the information should be stored.

4. Once the data is stored, it may require cleanup. In the example model, we want the 52-week high and low in separate cells, but the web download puts them in one single cell (cell C14 on the Web Download sheet). Parsing functions that help clean up text are described in further detail in the Toolbox later in this chapter; however, we will go through how to extract the information needed. On the Web Download sheet, enter the following text in the corresponding cells:

   E3: **Clean Up**
   E4: **52wk High**
   E5: **52wk Low**

5. We will parse out text from cell C14 in order to get the numerical stock prices that represent the 52-week high and low. Two of Excel's parsing functions, RIGHT and LEFT, are well suited for this task. We could use the LEFT function

on cell C14, with a 4 as the second parameter, to get the value 1.36; however, this formula could break down. If the stock price trended upward over the next year and the 52-week low was over 10.00, our function would pick up only one decimal place. For this reason we should use an IF function to prepare for such price movements. Enter the following formulas in their corresponding cells on the Web Download sheet:

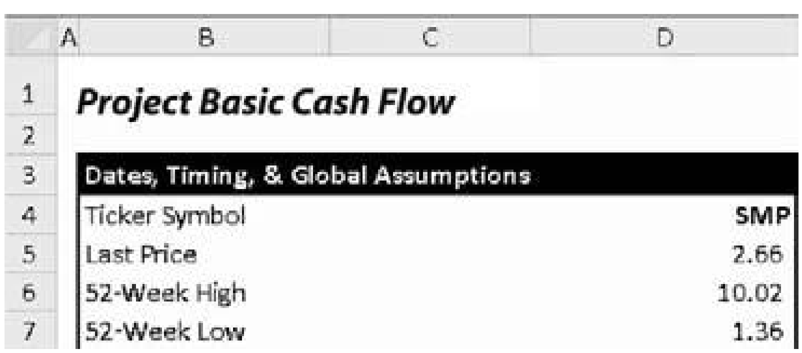
F4: **=IF(RIGHT(C14,7)="-",RIGHT(C14,4),RIGHT(C14,5))**
F5: **=IF(LEFT(C14,2)=".",LEFT(C14,4),LEFT(C14,5))**

Notice that these cells use tests to determine whether the low or high is one or two digits. Depending on the text that is included in your web download, you may need to enter similar conditional statements to ensure data integrity.

6. Once we have the web download information cleaned up, we can reference it directly on the Assumptions sheet for quick viewing. Go to the Assumptions sheet and enter the following text and formulas in the corresponding cells:

B4: **Ticker Symbol**
B5: **Last Price**
B6: **52-Week High**
B7: **52-Week Low**
D4: **SMP**
D5: **='Web Downloads'!C4**
D6: **='Web Downloads'!F4**
D7: **='Web Downloads'!F5**

The final outcome of the web download functionality is displayed on the Assumptions sheet, as seen in Figure 10.4.



	A	B	C	D
1		***Project Basic Cash Flow***		
2				
3		**Dates, Timing, & Global Assumptions**		
4		Ticker Symbol		**SMP**
5		Last Price		2.66
6		52-Week High		10.02
7		52-Week Low		1.36

FIGURE 10.4 The Assumptions sheet references the Web Downloads sheet, where a web query is set up to download stock information from the Web.

MODEL BUILDER 10.3: CREATING THE OUTPUT SUMMARY SHEET

1. Insert a worksheet after the DCF sheet and name it **Output Summary**. This Model Builder is a bit different from many of the earlier ones in that readers will have to rely on the complete example model on the CD-ROM for many of the cell references. This is because the Output Summary contains many repetitive references that are best seen directly in the example model. However, there are a few cells and formulas that should be explained. For now, go to the example model and copy over the text, references, and formulas noting the following:
2. The first notable formula on the Output Summary sheet is in cell K9:

   =IF(COUNTIF(Assumptions!O4:O8,"OK")=COUNTA (Assumptions!O4:O8),"Pass","Fail")

   The purpose of this formula is to return a "Pass" if all of the internal validations from the Assumptions sheet have passed. Otherwise, a "Fail" is returned. This functionality is accomplished by using the COUNTIF function to count the number of internal validations that are set to "OK." If the COUNTIF function is new to you or unclear, refer to the Toolbox at the end of this chapter. The COUNTIF function will return a number from 0 to 5 depending on the number of internal validations that have "OK." The number returned is compared to a count of the total internal validation tests. Counting the total internal validation tests is done using the COUNTA formula, which counts the total nonblank cells in a reference range. This function is also explained in this chapter's Toolbox. An IF function tests whether the number of tests with an "OK" is equal to the total number of tests. If so, a "Pass" is returned; if not, a "Fail" is returned. The top of the Output Summary is depicted in Figure 10.5.

	A	B	C	D	E	F
1	**Project Basic Cash Flow**					
2						
3	**Case Description**					
4	Stock Ticker:	SMP		Unsecured Rating:	A	
5	Last Price:	2.66		Forecast Beta:		1.90
6	52-Week High:	10.02		Long Term Beta:		1.00
7	52-Week Low:	1.36		Risk Premium:		6.50%
8	Last Historical FY	12/31/2007		Capex to Dep:		110.00%
9	Current FY	12/31/2008		WC% of Revenue:		30.00%
10						
11	**Scenario:**	Base Case				

FIGURE 10.5 The top of the Output Summary contains basic information that describes the firm and the scenario under analysis. Note that this is a partial screen shot of the top part of the Output Summary and that there are more columns in the example model.

3. We should go to cell B17 in the Output Summary sheet. The following formula should be already entered in the example model:

   ='Income Statement'!D5*OFFSET(Hidden!$E$6, MATCH(inputs_Units,lst_Units,0),0)

   A standard OFFSET MATCH combination is used to multiply the values from the income statement by the units that the user selected. This will put the values from the financial statements in terms of units that the user desires. Notice that this is done for the income statement, balance sheet, and cash flow statement.
4. The final section of the Output Summary sheet that should be customized is a section covering key rates and ratios. If you implemented the Output Summary sheet from the example model, you will have four key rates and ratios. The text that should be entered in corresponding cells is as follows:

   A118: **Interest Coverage Ratio (EBITDA)**
   A119: **Debt Service Coverage Ratio (EBITDA)**
   A120: **10Y Treasury**
   A121: **1M Libor**

   Be mindful that this section should be determined by the needs of the specific transaction you are working on. In this example we have been focusing on debt quite a bit, so the two ratios in cells A118 and A119 are debt related. They are actually quite common to corporations since the ability of the firm to service debt is paramount to financial viability. The first of the two ratios, the *interest coverage ratio* (ICR), examines the interest expense compared to EBITDA each period. The second ratio, the *debt service coverage ratio* (DSCR), examines both interest and principal expense compared to EBITDA each period. Typically ICRs and DSCRs are calculated with either EBITDA or EBIT as the numerator. Be careful here as it can be done differently depending on who is doing the analysis. As for the denominator, you should also be careful to see what interest expense or principal due is being calculated. Concepts such as *payment in kind* (PIK) interest and nonscheduled principal are frequently excluded from these ratios. Also, these ratios are sometimes calculated using four-quarter averages in order to reduce volatility.
5. Implement the key rates and ratios in the example model by entering the following formulas in the corresponding cells:

   C118: **=IF('Income Statement'!E32<inputs_Precision,0,'Income Statement'!E13/'Income Statement'!E32)**
   C119: **=IF(('Income Statement'!E32+Debt!E21+Debt!E31+Debt!E41)<inputs_Precision,0,'Income Statement'!E13/('Income Statement'!E32+Debt!E21+Debt!E31+Debt!E41))**
   C120: **=Vectors!E34**
   C121: **=Vectors!E37**

	A	B	C	D	E	F	G	H
116	Key Rates and Ratios		Projected ---->					TV Year
117		12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
118	Interest Coverage Ratio (EBITDA)		212.82	46.05	80.81	127.33	247.62	661.74
119	Debt Service Coverage Ratio (EBITDA)		212.82	12.02	14.63	16.99	24.37	41.99
120	10Y Treasury		3.00%	3.50%	4.00%	4.50%	5.00%	5.50%
121	1M Libor		4.20%	4.20%	4.20%	4.20%	4.20%	4.20%

FIGURE 10.6 The Output Summary should also provide summary calculations such as key ratios.

Copy and paste these formulas over to column H in their respective rows. Figure 10.6 shows the bottom part of the Output Summary where key rates and ratios are stored.

CHARTS

Important data should stand out to users to be understood quickly. Charts are an excellent way to visualize data. Excel makes it easy to create multiple types of charts, but what are often not known are the tricks to make them appear dynamic. The effect can go a long way in the field of finance, where data is often seen as a dry set of black-and-white figures. Figure 10.7 shows a chart with dynamic capabilities.

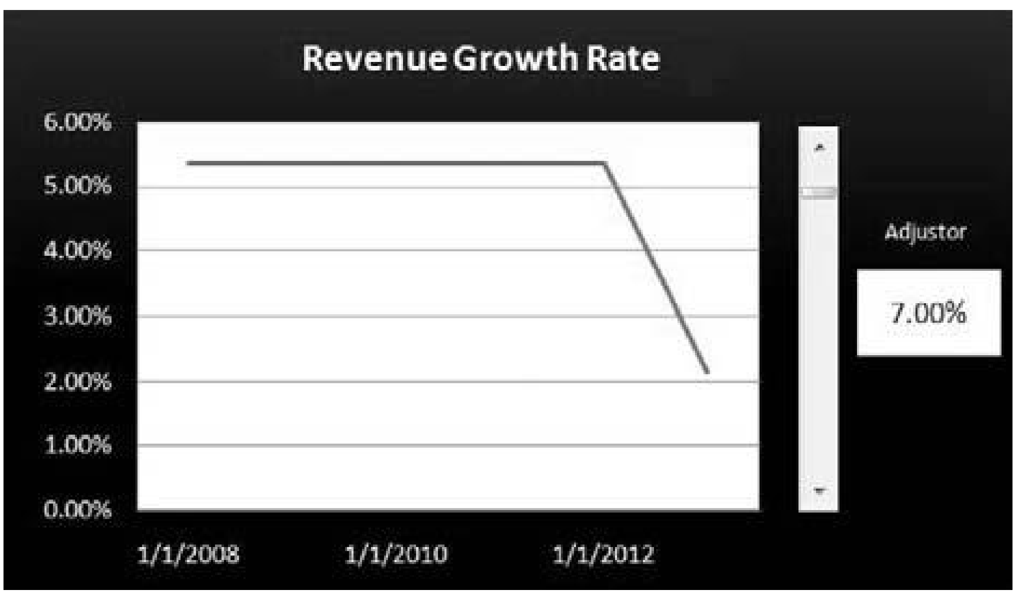


FIGURE 10.7 This chart on revenue growth allows the user to move a scroll bar to visualize the effects of incrementally changing the growth rate.

MODEL BUILDER 10.4: CREATING DYNAMIC CHARTS

1. In this Model Builder, we will create the Chart sheet, which contains a number of charts to visualize data. One of these charts will contain functionality known as a *scroll bar*, which, when hooked up correctly, makes the chart seem dynamic. Insert a worksheet after the Output Summary and name it **Charts**.
2. Prep the Charts sheet by entering the following formulas and text:

   A1: **=inputs_ProjName**
   A2: **="Units in"&inputs_Units**
   L1: **"Analysis Date:"**
   N1: **=TODAY()**

   Notice that in cell A2 we used the "&" symbol for concatenating. If this is not clear, refer to the Toolbox later in this chapter.
3. Create four charts. Refer to the example model for chart ideas. In order to continue with this Model Builder you should at least make one of those charts based on the revenue unit and sales growth rate. The other three examine the debt amortization of each issuance, the firm's capital expenditure plan, and periodic working capital expectations. In all versions of Excel, the process of creating a chart is simplified by using the Excel chart wizard. From this step on, you should either create at least the first revenue growth rate chart or refer to the complete example model for reference.
4. While creating charts is straightforward, making them appear dynamic is not as easy. To do this, we will use a combination of Form tools and Text boxes. On the Charts sheet, go to the revenue growth rate chart. Make sure that there is room on the right side of the chart. On that side we will insert a scroll bar. To do this, we must access the Form tools, which differs depending on your version of Excel:
   - *For Excel 2007:* In this version of Excel, we have to view the Developer tab first. However, when Excel 2007 is first installed, the default setting does not make the Developer tab visible. Go to the **Office** button, **Excel Options**, and under the **Popular** selection check the checkbox to **Show the Developer tab in the Ribbon**. The Developer tab should then be visible. On the Developer tab there is a section named "Controls" and a button named "Insert." Left-click on **Insert** to view the Form and ActiveX tools. We will be using only the Form tools since ActiveX controls require code to run. Figure 10.8 shows this selection.
   - *For Excel 2003 or earlier:* To view the Form tools, go to the **View** menu, select **Tool Bars**, and further select **Forms**.

   Regardless of the version of Excel you are using, select a **scroll bar** from the Form tools. Drag the cursor over the right side of the revenue growth rate chart so that a vertical rectangle–shaped scroll bar is created.

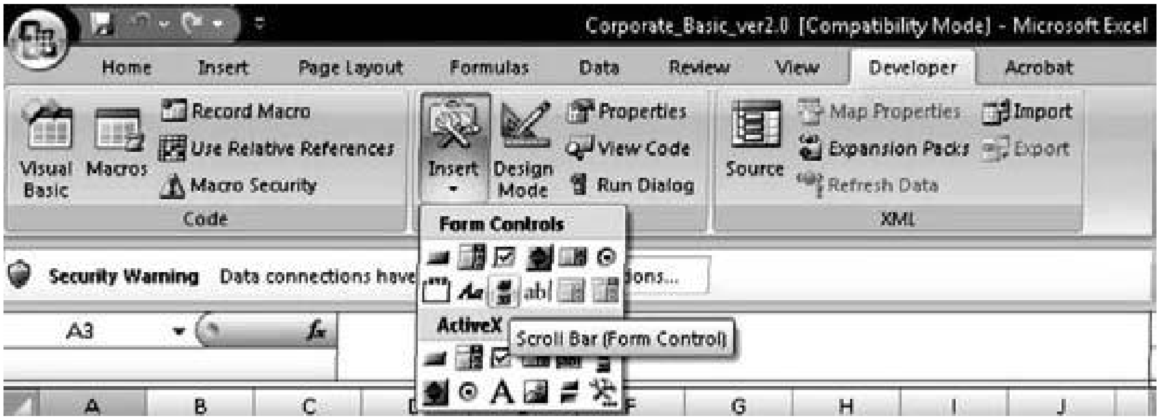


FIGURE 10.8 Form tools can be selected from the Developer tab and are useful for creating dynamic charts.

5. In order to make any of the Form tools work, we have to create a cell link. The *cell link* is a cell-based response to the user's actions on the Form tool. Right-click on the scroll bar on the Charts sheet and select **Format Control**. Under the **Control** tab, select the **Cell link** field. Navigate to the Hidden sheet and select **D21**. Press **OK**.
6. We can immediately test how the scroll bar works by going to the Charts sheet and moving the bar in the scroll bar up or down. Go to the Hidden sheet and notice that the value in cell D21 changes. The change is dependent on the settings under the Format Control selection of the scroll bar. Go back to the Charts sheet and right-click on the scroll bar again. Under the **Control** tab you will notice the following options (functional descriptions are provided, but not part of the Excel dialogue box) to control how the cell link changes when the user moves the scroll bar:
   - *Current value:* The value the cell link is currently set to. Enter a value of **0**.
   - *Minimum value:* The lowest value the cell link can be. It must be an integer. Enter a value of **0**.
   - *Maximum value:* The highest value the cell link can be. It must be an integer. Enter a value of **100**.
   - *Incremental change:* The unit of increase or decrease the value in the cell link changes when the user selects and moves the bar in the scroll bar. Enter a value of **1**.
   - *Page change:* The unit of increase or decrease the value in the cell link changes when the user selects in between the bar and the upper or lower bound of the scroll bar. Enter a value of **10**.
7. Since we can use only integers with the scroll bar and in our example we want to change rates, we need to create an additional calculation on the Hidden sheet. Go to the Hidden sheet and enter the following formula in cell D22:

   =D21/100

Name cell D22 **ctrl_GlobalGrowth** and label the area by entering the text **Growth Chart Link** in cell D20. Name cell D22 **ctrl_GlobalGrowth**.

8. A user making scenario changes might want to adjust the global growth setting. We will create this reference on the Assumptions sheet. Go to the Assumptions sheet and enter the following formula in cell K26:

   =ctrl_GlobalGrowth

   Name this cell **inputs_GlobalGrowth.**

9. In Chapter 3, we implemented inputs_GlobalGrowth in the growth rate formula on the Vectors sheet. We can now move the scroll bar on the Charts sheet and see the growth rate assumption change. We might want to see the growth rate adjustor value directly on the chart. This can be done by going to the Charts sheet and inserting a rectangle shape. To insert shapes in Excel:
   - *For Excel 2007:* Go to the **Insert** tab, select **Shapes**, and select a rectangle.
   - *For Excel 2003 or earlier:* Go to the **View** menu, select **Tool Bars**, select **Drawing**, click on **Autoshapes**, and select a rectangle.

   Draw a rectangle to the right of the scroll bar. Left-click and select the newly drawn rectangle. Many users do not realize it, but a shape can contain a

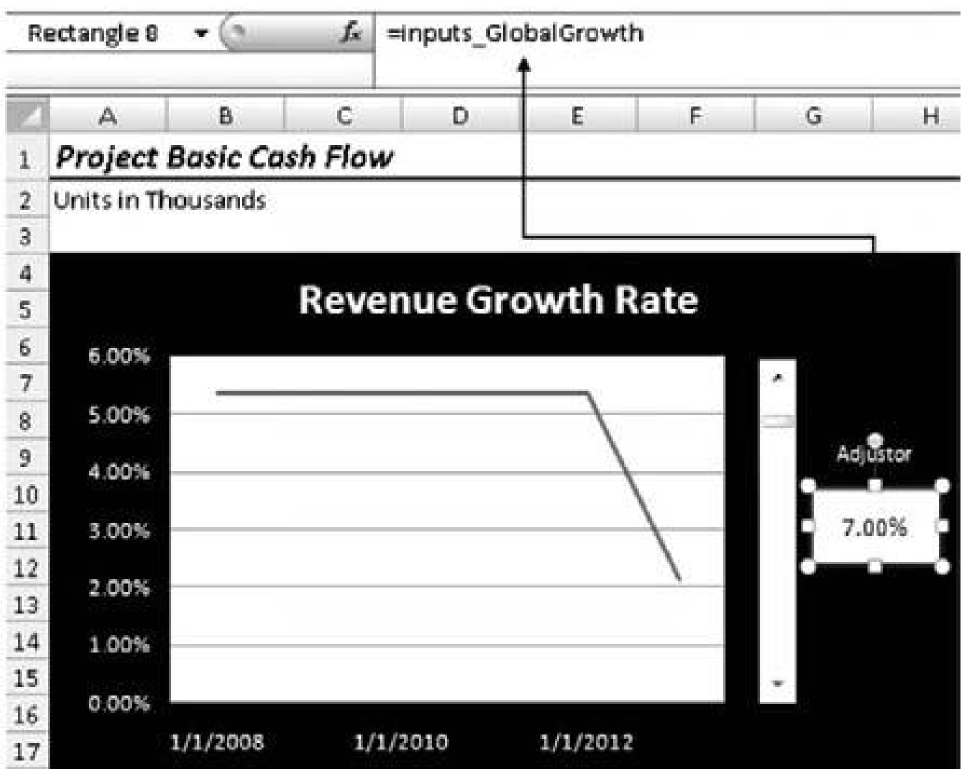


FIGURE 10.9 Using forms in conjunction with charts and drawing objects produces a powerful, dynamic effect.

value. It's as simple as going to the formula bar, once the shape is selected, and entering a reference. With the rectangle selected, go to the formula bar and enter the following reference:

=inputs_GlobalGrowth

10. We can label the rectangle by inserting a text box above the rectangle with the text **Adjustor** inside. To create a text box:
- *For Excel 2007:* Go to the **Insert** tab, select **Text Box** under **Basic Shapes**.
- *For Excel 2003 or earlier:* Go to the **View** menu, select **Tool Bars**, select **Drawing**, click on **Autoshapes**, and select a text box.

Figure 10.9 shows the completed text box, the rectangle, and how the rectangle is connected using a function in the formula bar.

TOOLBOX

Parsing Functions: LEFT, RIGHT, MID (and the DATE Function as a Bonus)

Financial analysts frequently want the ability to parse text if they use Excel with other electronic sources such as web downloads or copying and pasting financial data from .pdf documents. To do this, users can access Excel's prebuilt parsing functions. Each of these functions takes user-defined "pieces" of text in a cell. To examine each parsing function, we will run through an example using a date that was cut from a .pdf report. When the date is pasted into Excel, it comes out in this format:

20090501

Assume that the user knows that the intended date was May 1, 2009; however, the numbers shown above have been exported instead. In this situation, Excel does not recognize the date format and will assume it is text (or possibly a number, depending on the source of data). We can start cleaning up this information by first parsing out the year.

To get the year from the text string above, we can use the LEFT function. The LEFT function takes the following parameters:

LEFT(text or cell reference containing text, number of characters to return starting from the left side)

The parameters explain the function well. If we used the LEFT function on the cell that contains 20090501 and used 4 as the second parameter, the value 2009 would be returned.

We can then take a similar approach to get the day, but this time using the RIGHT function. The RIGHT function takes the exact same parameters as the LEFT function, but instead of starting from the left side of the text, it starts from the right. To get the day from the text string we would use the RIGHT function with a 2 as the second parameter. This would return 01.

The final piece of information required is the month, which is stuck in the middle of the text string. While we could use the LEFT and RIGHT function in combination, an easier approach is to use the MID function. The MID function takes the following parameters:

MID(text or cell reference containing text, number of characters to start taking text from, number of characters to return starting from the second parameter value)

In our example, we would use the MID function on the text, a 5 for the second parameter, and a 2 as the third parameter. A common mistake in using this function is not realizing that the second parameter is where the third parameter will start parsing. Some initially think that the second parameter should be the number of characters prior to the parsing location. Test this out in Excel and you will quickly see the difference.

The final step would be to use the DATE function to create a date value. The DATE function accepts the following parameters:

DATE(Year, Month, Day)

We can quickly see that if we were to use the year, month, and day returned from the parsing functions, within the DATE function, we would have a serial-formatted date value. All of these functions can be quickly copied down rows or across columns to adjust improperly formatted text. They can also be used with the web downloads in order to remove excess information. The process is reviewed in Figure 10.10.

CONCATENATE and &

Just as we can parse text using functions, we can join text together using functions. The first of two methods is the CONCATENATE function. This function accepts the following parameters:

CONCATENATE(text to be joined, text to be joined . . .)

Essentially, multiple text entries or cell references containing text can be entered using this formula. The results are then joined together in the cell where the function resides. Remember that when text is entered directly in functions the text string requires double quotes at the beginning and the end. Even if you would like to create a space, you must bound it by double quotes. If you fail to use double quotes correctly,

PDF Downloaded Date
20090501

1. **Parse the year using the LEFT function:**
=LEFT(C3,4)

2. Parse the day using the RIGHT function:
=RIGHT(C3,2)

3. Parse the month using the MID function:
=MID(C3,5,2)

4. Use the DATE function to get a serial-formatted date:
=DATE(C6,C12,C9)

FIGURE 10.10 Parsing functions allow us to clean up downloaded data so that it can be used for financial modeling purposes.

Excel will think you are referencing a function or a named range, which it will most likely not find (unless there is coincidental duplicity), and return a #NAME? error.

The shortcut to using the CONCATENATE function is using the "&" symbol. For instance, if cell A1 contained my first name, Keith, and cell B1 contained my last name, Allman, I could join the two together in cell C1 by the following formula:

=A1&" "&B1

Notice that double quotes were used with a space in order to separate the first and last names. Otherwise, if **A1&B1** were entered, the name would appear as KeithAllman.

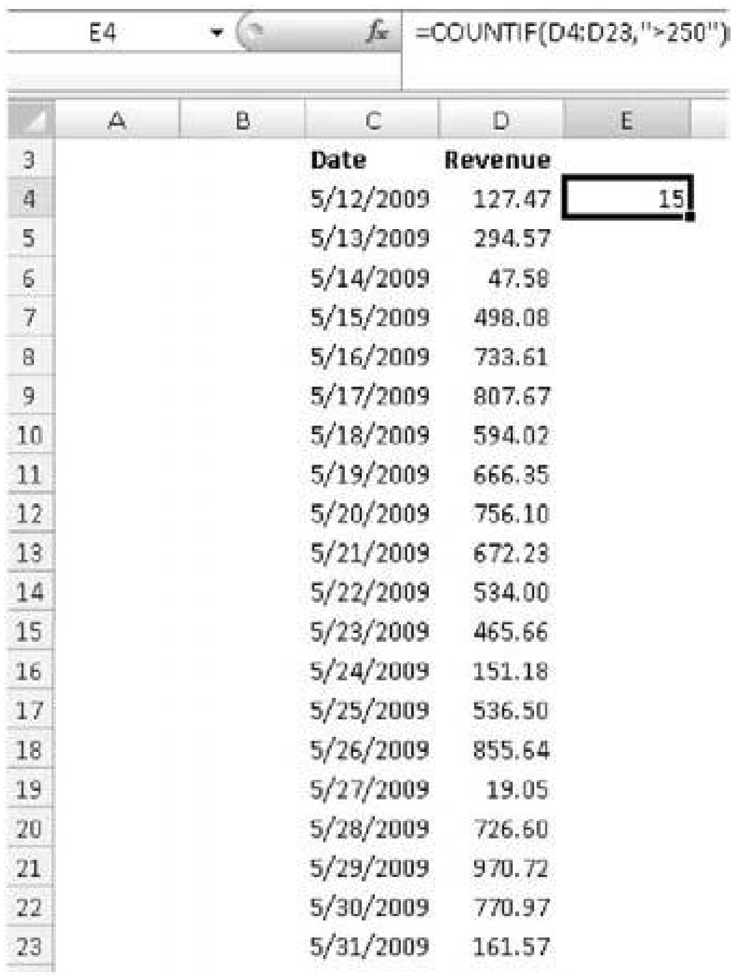
LEN

Occasionally, we might need to know the number of characters in a text string. This information can be useful for working with external data that has variable returns in the same cell. For instance, in the example model we reference the stock price from the Web Downloads sheet. Since the stock price has text attached to it we used the LEFT function to parse out the numerical information. This is fine if the stock stays under $10, but if the stock goes into double digits we will lose a decimal place's worth of data. We could use the LEN function on the web download to count the number of characters. We could then test the LEN return to see whether it is a value that corresponds to a single-digit stock price or a double-digit stock price. If the return corresponds to a double-digit stock price, then our LEFT function's second parameter would be one value higher than the initial LEFT function.

COUNTIF, COUNTA

Cell-counting functions are important for conditional tests as we have seen in this chapter. Two valuable counting functions are *COUNTIF* and *COUNTA*. COUNTIF accepts a range of cells and counts them if the contents meet a certain criteria. The entry parameters for the COUNTIF function include:

COUNTIF(range of cells to be counted, criteria of cell contents to test whether the cell should be included in the count)



E4 =COUNTIF(D4:D23,">250")

	A	B	C	D	E
3			**Date**	**Revenue**	
4			5/12/2009	127.47	15
5			5/13/2009	294.57	
6			5/14/2009	47.58	
7			5/15/2009	498.08	
8			5/16/2009	733.61	
9			5/17/2009	807.67	
10			5/18/2009	594.02	
11			5/19/2009	666.35	
12			5/20/2009	756.10	
13			5/21/2009	672.23	
14			5/22/2009	534.00	
15			5/23/2009	465.66	
16			5/24/2009	151.18	
17			5/25/2009	536.50	
18			5/26/2009	855.64	
19			5/27/2009	19.05	
20			5/28/2009	726.60	
21			5/29/2009	970.72	
22			5/30/2009	770.97	
23			5/31/2009	161.57	

FIGURE 10.11 In this example, the COUNTIF function is used to count the number of days when revenue exceeded 250.

In the example model, we used the COUNTIF function to quantify the number of internal validations that passed. This was done by referencing the internal validation cells as the range of cells to be counted and the criteria of the cell contents being an "OK." Cells in the range that had a value of "OK" are counted. An alternative example is shown in Figure 10.11.

The value returned from the COUNTIF function is compared against the number of internal validation tests. Rather than hard-coding the number of tests into the formula, we use another counting function called COUNTA. This function counts the number of nonblank cells in a range. It accepts the following parameters:

COUNTA(range of cells to possibly count)

COUNTA returns a numerical count of nonblank cells, which means that even a zero that is entered into a cell will be counted.

Hyperlinks

Hyperlinks are a useful tool to quickly move through areas of the workbook. In the case of the Output Summary and Vectors sheets, we used them to navigate to specific section of the same sheets. On the Output Summary sheet created in this chapter, we inserted text into cells in row 11 that jumped to respective sections of the sheet. This is done by right-clicking on a cell with text and selecting **Hyperlink**. This action will bring up the Hyperlink dialogue box, where a user can select to link the cell text to an existing file or web page, to a location within the workbook, in a new document, or to an e-mail address that will initiate the default mail application. Select **Place in This Document**. From this selection the user has the option of selecting a sheet and a cell reference or a named range. This selection is where users will be brought to when they left-click on the original cell's text. In the case of the example model, we selected cells from the Output Summary sheet that correspond to where the Output Summary income statement, balance sheet, cash flow statement, and key ratios and rates reside.

11

Automation Using Visual Basic Applications (VBA)

A powerful capability of all Microsoft Office applications is the ability to program actions using the *Visual Basic Applications* (VBA) programming language. For Microsoft Excel, VBA is especially useful for frequently used commands that require multiple procedures and repetitive actions, and in more advanced situations for calculations that exceed the spreadsheet's processing ability. Examples relevant to corporate valuation modeling include creating a system to run various sensitivity scenarios, implementing iterative processes in code that overcome the circular references left in DCF models due to financial plugs, and installing buttons and checkboxes to control sheet printing and report distribution. Implementing such functionality requires a basic understanding of the VBA language and how the language interacts with Excel.

Most users have unknowingly used VBA by recording a macro to complete simple repetitive tasks. However, few take the step to learn how to write and edit VBA code by hand. The problem most users have with unlocking the full potential of VBA is learning how an *object-oriented programming* (OOP) language works. While entire books can and have been written on using VBA, this chapter introduces the model operator to the basics of using VBA through additions to the example model. Beginners might find additional texts helpful for further explanation, while intermediate-to-advanced users might want to skip to the specific code examples.

THE OBJECT-ORIENTED PROGRAMMING LANGUAGE (OOP)

Programming in VBA requires a shift in thought. We have to move from thinking about financial modeling in terms of Excel worksheet, cells, functions, and formulas to *text-based* instructions. This means we have the difficult task of taking visual tools that manipulate concepts and replacing those tools with text. To complicate matters, the text is written in English, but not in a manner we are accustomed to.

To help us make sense of this new language, we should learn about its structure. If one pictures the first soon-to-be computer programmers sitting in a room and deciding how they would recreate the world in code, one could imagine grandiose

Examples			
	Tangible	Financial	Excel
Object	Car	Loan	Cell Range
Property	Car Color	Loan Term	Cell Fill
Method	Drive Car	Amortize Loan	Copy Cell

FIGURE 11.1 There are a multitude of examples for objects, methods, and properties.

thoughts about virtual reality, artificial intelligence, and genetic algorithms. Although that's the cutting edge today, the foundations are much simpler. If we were to isolate three basic elements of OOP, we would see this recreation is based on items around us, descriptions of those items, and instructions to put the items into action. These elements are otherwise known as *objects*, *properties*, and *methods*. Examples of each are shown in Figure 11.1.

Objects

As part of the name, it's clear that objects are important to OOP. Objects can be thought of as the nouns of OOP. They are not as granular as something like atoms or molecules, but more of a representation of items around us, such as people, cars, or houses. To make the transition to finance, we can think of an object like a financial instrument, such as a loan. To make the transition to Excel we must visualize each cell, worksheet, and workbook as objects.

Properties

If objects are the nouns of OOP, properties are the adjectives. Properties describe objects to differentiate each object from similar objects. If we use a car as an example, we can have a green car, a red car, a Honda, a Toyota, and so on. In terms of our financial example, where a loan is an object, that loan can have its own unique balance, rate, and term. Continuing with our Excel example, a cell could have a characteristic such as its fill color.

Methods

Finally we get to action. Methods put objects into action just as verbs bring nouns to life. Cars are brought into action through driving and can move forward, left, right, and backward. A loan can be amortized over time in order to pay the balance down. In Excel we can do many different actions; some of the easiest are copying and pasting the contents of one cell to the next.

FOLLOW THE RULES

With the least amount of reference to the movie *The Matrix* possible, I should state that in computer programming we must follow the rules. Objects can be described only by properties and put into action only by methods that have been created for the object. For instance, so far, cars cannot fly; therefore, if we tried to use a "fly" method on a car object that we created in the standard sense of a car, the code would crash. Unless we specifically program in the fly method, the code will not work.

On an even simpler note, we will not be creating our own objects in this chapter. This means that we must use the objects that have been created for us in the default VBA libraries and can use only the properties and methods that the Excel designers have associated with those objects. If we try to use existing properties or methods with objects that are not associated with those properties or methods, we will also encounter errors.

Similarly, there will be commands that are part of the VBA language that must be used in specific ways. We cannot deviate from the preprogrammed applications of these commands. Any disordering or misspelling will cause the code to break down. Following such a specific rule set and learning what is virtually an entirely new language is part of the reason why many people become so frustrated learning VBA. In this chapter, we will limit the objects, properties, methods, and commands to those that are absolutely critical to financial modeling. Also, while there may be more efficient VBA coding that can run faster than what we are implementing, the subject matter and techniques that we will learn will be limited to as few new concepts as necessary and the fastest ones to pick up as a new programmer.

THE VISUAL BASIC EDITOR

To help us organize and work with the VBA language, the designers of Microsoft Office included an *integrated development environment* (IDE) called the *Visual Basic Editor* (VBE). VBA code can be written, stored, run, and debugged from the VBE. This makes our life easier as new programmers since we do not need to compile in a separate program or create executable files to run our programs. To access the VBE:

- *For Excel 2007:* Visual Basic options are contained on the Developer tab of the ribbon. Chapter 10 explains how to get the Developer tab to show up on the ribbon if it is not visible. An alternative to this process is pressing **ALT-F11**; however, the Developer tab should be kept visible to easily access other tools.
- *For Excel 2003 or earlier:* Go to **Tools**, **Macro**, **Visual Basic Editor** or use the **ALT-F11** keyboard shortcut.

The VBE will open in a separate window and should appear as in Figure 11.2.

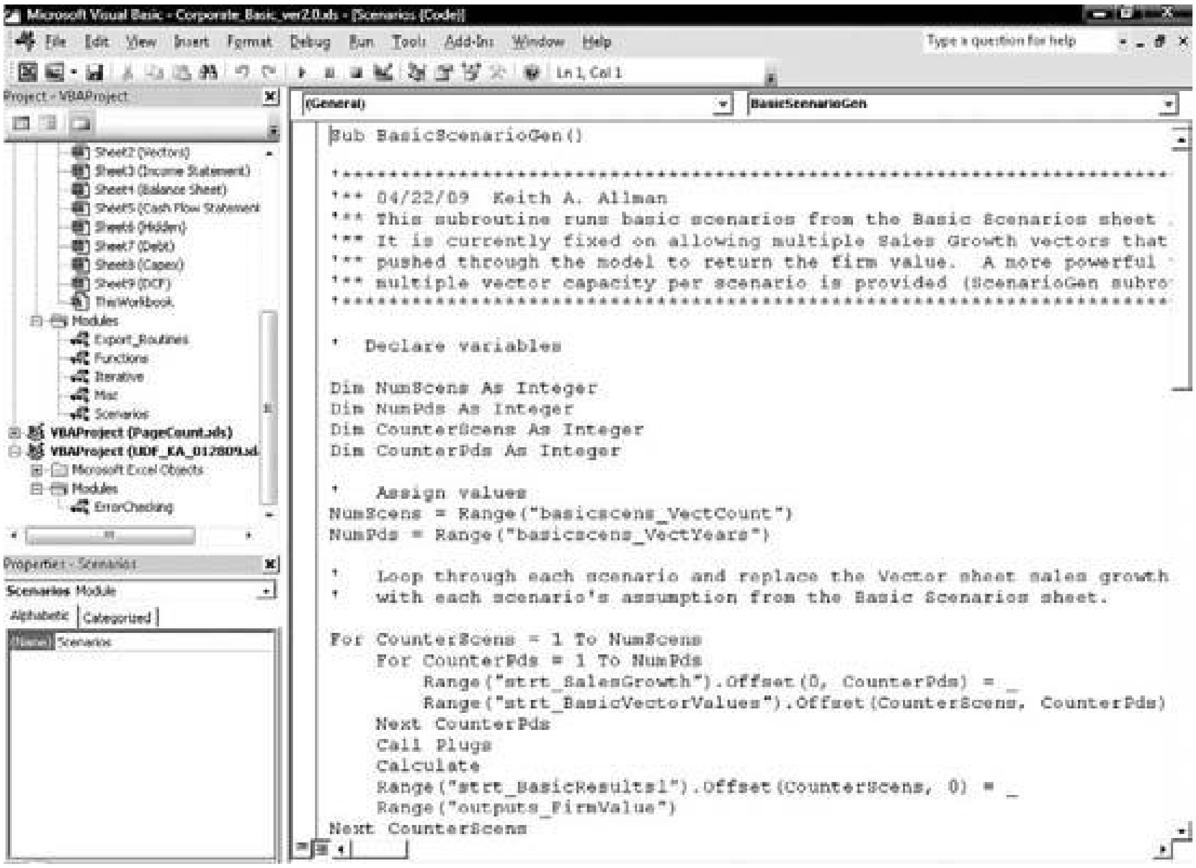


FIGURE 11.2 The Visual Basic Editor (VBE) is Visual Basic Applications' (VBA) integrated development environment.

The Menu Bar

The general menu bar features recognizable commands such as File and Edit; however, most of the options within each command will seem strange to a new user. View and Insert are the two key menus that we will use. In addition to menus, there are many buttons that will appear new. Look at the Standard Toolbar that should appear as a default setting.

The Standard Toolbar has a few buttons that will be useful for the basic operation of the VBE. Keep in mind the following:

- *View Microsoft Excel* jumps back to the Excel workbook.
- *Run Sub/UserForm* runs the code currently selected.
- *Break* breaks the code currently being run.
- *Reset* resets the code after a break has occurred.
- *Object Browser* opens the library of VBA objects.

The menu bar is shown in Figure 11.3.

FIGURE 11.3 The menu bar assists in the code-writing process.

The Project Explorer and the Properties Window

To the left side of the VBE, there are two important windows: the Project Explorer and the Properties Window. The Project Explorer looks a little like Windows Explorer in the way it organizes information. It is set up as a directory tree where more detailed information within a general concept can be expanded or compressed by clicking on + and − symbols.

The most general category in VBA is a Project, which is essentially the Excel workbook. The workbook that you are in is distinguished by its name, which is in brackets. A common mistake is to have multiple workbooks open and to start typing code in the wrong workbook. Make sure that the workbook that you want the code stored in is selected. Keep in mind that even if you have just one workbook open there may be multiple VBAProjects listed. The other projects are most likely add-ins, particularly since you may be using Excel after installing the VBA Analysis Tool Pak, as recommended in Chapter 1. Other add-ins that are installed are identified as .xla for .xlam files.

The first subfolder contains the Excel objects, which are the individual sheets in the workbook. Code can be stored under a sheet or for the workbook in general, but code stored in these areas is for very special purposes and should not be done until a user understands more about the VBA language. Just as we will be careful which workbook is selected, we should be careful if a sheet or **ThisWorkbook** is selected.

The area in which we will be entering our code is in a module. *Module* is a fancy term for a separate area to enter code. Code is often organized by purpose and functionality into separate modules. Within modules we can write code in two styles: subroutines and functions. A *subroutine* is like writing a list of commands. The computer reads this list in the order that it is entered and, in Excel's case, causes calculation or affects the workbook. Basic macros use one subroutine to accomplish a task, whereas more advanced macros often use multiple subroutines. Related subroutines are stored in the same module. For instance, a module might be named **Print_Routines** and contain three subroutines that format and print different sections of the Excel workbook. Figure 11.4 shows the project explorer.

The area that typically opens below the project explorer is the *properties* window. The properties window allows a user to graphically view and alter the properties of any object in Excel, simply by clicking on the object and going to the properties window. The properties window is shown in Figure 11.5.

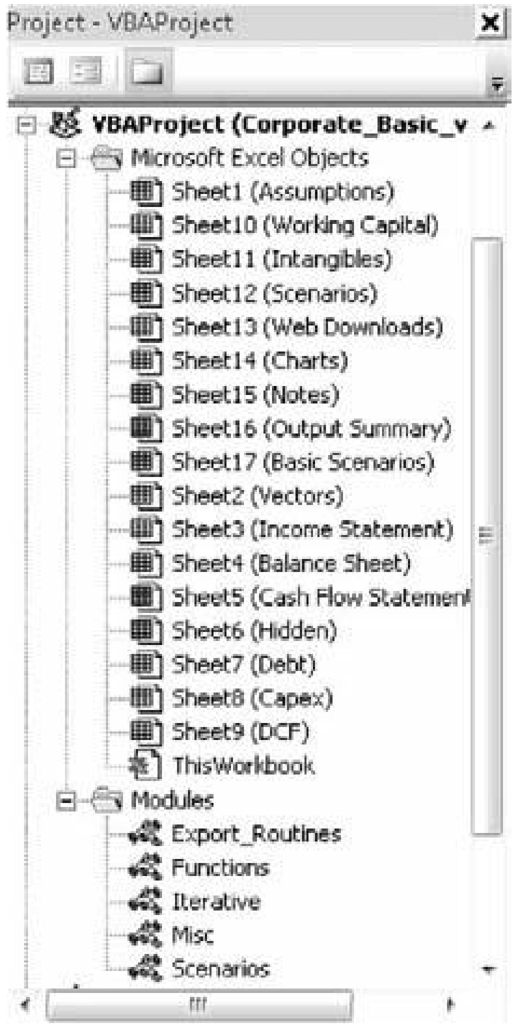


FIGURE 11.4 The VBE project explorer is similar to a Windows directory. It helps us organize and locate our code.

WRITING CODE: SUBROUTINES AND FUNCTIONS

Although there are two ways of writing code, all of the code that we will write in this section is structured as subroutines. A subroutine is a way of writing code that is like a list of commands. When the commands are run, they are completed in order from beginning to end.

A *function* is code that returns a value when parameters are entered into it. Whereas a subroutine can return a value as a result of the commands entered, a function explicitly takes in parameters and returns a value from those parameters. Functions in VBA can be created not only to calculate in the computer's memory, but also for use on the sheet just as with any preprogrammed function we use.

FIGURE 11.5 Objects in the workbook and on the worksheet can be viewed and altered using the properties window. In this example, a worksheet object is selected and its properties displayed.

UNDERSTANDING VBA CODE AND PRACTICING CODING TECHNIQUES

Before we jump right into a financial example using code, we will complete two separate examples to get a foundation in coding. The examples will be quite easy and seem unrelated to finance, but they introduce the core concepts involved in many of the underlying subroutines in the example model. Overall, we will seek to understand the following concepts and techniques:

- Moving data between Excel and VBA
- For Next loops
- Variables
- Offset property

To get practice with these concepts and techniques, the next two Model Builder exercises will not contribute to the actual example model, but are intended to develop the reader's skill prior to actually implementing the techniques in a financial modeling context.

MODEL BUILDER 11.1: MOVING DATA USING VBA

1. For this Model Builder, you should open a new workbook and save it as **VBATestCode.xls**. In this workbook we will set up the functionality to enter a name in one range, press a button, and have that button run code that replicates the name in a different cell.
2. The first step we usually take in any VBA project is prepping the workbook with as much Excel functionality as possible. By drawing on VBA only when we absolutely have to, we simplify our code and make it much easier for users to interpret. Obviously, this easy example can be entirely accomplished on the sheet, but let's learn about VBA by going through the steps.
3. Enter the text **Name** as a label in cell A1 of the first sheet. Then name cell A2 **MyName**. Also name cell C5 **Destination**. Naming ranges in Excel allows us to refer to them in a much easier and more reliable format than referring to them using the R1C1 (row-and-column) notation.
4. Press **Alt-F11** to get to the VBE. If you have multiple workbooks open, make sure to navigate to the correct VBAProject (VBAProject(VBATestCode_Book.xls)). In this project, insert a module by going to the **Insert** menu and selecting **module**. Click on the newly inserted module (Module1) to ensure that the correct code window is visible to the right.
5. Thinking about the basic structure of OOP and VBA that we learned earlier, we should recognize that the cells in the workbook are objects. In fact, we have applied names, which are properties, to two of the objects so we can refer to them in an easy fashion. We need to understand that we will be writing a list of commands to move the name from the MyRange cell to the Destination cell. This will be done using a subroutine. Click on the code window and enter the code `Sub NameMover()` and press **Enter**. An `End Sub` should automatically appear underneath. This process is how we initiate a subroutine and is done every time we want to create a new subroutine.
6. After we have initiated the subroutine, we should think about our task at hand. We probably want to refer to the MyName cell in some way. In VBA we can refer to a cell or a range of cells as "Range objects." This is done using the following convention:

```
Range(''NamedRange'') or Range(''R1C1 reference'')
```

   In our example, we should enter the following code underneath `Sub NameMover()`:

```
Range(''MyName'')
```

7. We should notice what happens if we type a period (.) after the line of code above. You will see that a drop-down box appears with different named items. This is actually a list of the possible properties and methods that can be used with

FIGURE 11.6 Properties and methods work with objects by entering a period or dot after the object.

a Range object. The VBE assists us in using properties and methods correctly in this way. Some may think we should try to use the Copy property (you can check and see that it is there in the drop-down list as shown in Figure 11.6). However, we will learn the most efficient method of doing this procedure.

8. We can directly move or assign values in VBA by using the equal sign (=). Modify the code that was just entered in step 6 so that it reads:

```
Range(‘‘Destination’’) = Range(‘‘MyName’’)
```

Notice here that something seems backwards. We started by focusing on MyName, but now are first referencing the Destination range and setting it equal to the MyName range. This ordering with the equal sign is how VBA works. An easy way to remember this is by thinking of the phrase: “The left side of the equal sign accepts what the right side provides.”

One thought on why this concept causes difficulty for many people is that in Western languages we often refer to objects or nouns later. In English, the noun often comes at the end of the sentence, such as “How are you?” In many non-Western languages, the noun comes first. For instance, in Hindi you would say, “Tum kaise ho?,” which is translated literally into English as “You how are?” Computer code is more similar to the latter style, where the object we want to affect starts the line of code.

9. This single line of code is all that is required to compose the subroutine. Some experienced VBA programmers may suggest using the Value property after each range object so that the code looks as follows:

```
Range(‘‘Destination’’).Value = Range(‘‘MyName’’).Value
```

But this is not necessary, unless we are concerned with cell formats or formulas. If we are concerned with those, we might need to use additional properties, such as the Formula property, if we want a formula to be replicated.

10. To run this subroutine, we could use the Run button on the VBE tool bar that we discussed earlier, but everyone gets satisfaction out of creating buttons and

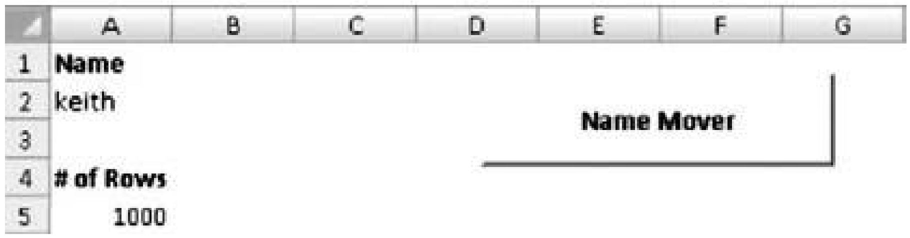


FIGURE 11.7 The subroutine for the NameMover macro is controlled by a Forms button.

pushing them to do things, so we should learn about buttons. Go back to the Excel sheet where we named the ranges and entered our name. To insert a button, go to the **Forms** tools. If getting to these tools is unclear, refer to Chapter 10 for a review of the process. Select the **button** tool. Left-click and drag a button directly on the sheet that we were working in. The minute the left-click is released, a dialogue box will come up prompting the user to select a macro to assign to this button. Select the **NameMover** macro.

11. Once the macro is assigned, we can change the name from Button1 to any custom name that we desire. Name the button **Name Mover**. Select outside of the button so that we are no longer editing the button itself. When the pointer is scrolled over the button, it should change from the default arrow to a hand. Push the button and the NameMover macros should run successfully. The final view of the sheet is shown in Figure 11.7.
12. The final code should read:

```
Sub NameMover()
Range("Destination") = Range("MyName")
End Sub
```

Loops

The real power of VBA is brought out when we work with loops. Looping is a programming technique that repeats a section of code for a certain number of iterations or until a condition is met. This is important for financial modeling for a number of reasons:

- Loops allow systematic movement throughout a model so multiple cells can be referenced and manipulated quickly and repetitively.
- Memory-intensive calculations can be done quickly. For instance, if we were to amortize a pool of 5,000 loans on a monthly basis, an Excel-based implementation would crash. However, a VBA-based implementation would work quickly.
- Loops can exceed Excel's limitations. If we were to run a simulation for 100,000 iterations, we would not be able to do this on the Excel sheet in Excel 2003 or

earlier. Even in Excel 2007 we would still want to use VBA since the previous point about memory and calculation speed problems would occur.

Overall, we will find loops an essential technique to learn in order to have full flexibility with coding.

Variables

In order to learn a basic loop, we must also learn about variables. *Variables* are just as we remember from algebra: symbols that represent a value that can vary. In the case of VBA, the symbol is most likely text and the value can be a number, text, date, or TRUE or FALSE value. Variables are important to use in coding for two main reasons:

1. *Code management:* We should structure code so that we assign values to variables early in the code and then use the variables throughout the code. The reasoning behind this is that if we need to change the value reference, we will have to do it only once in the beginning of the code. Then the variable used throughout the code will be fine. However, if we did not use a variable and directly referenced the Excel sheet every time we needed a value, we would have to change all of the references throughout the code if the Excel sheet reference changed.
2. *Memory management:* Using variables allows us to reduce memory use and make our programs run faster. This is done in two separate ways. The first is a byproduct of proper code management above. If we use variables throughout our code, we limit the in-and-out processes between VBA and Excel. These processes are much more memory demanding than basic calculation with variables. Limiting our code to as few in-and-out processes as possible will create fast, robust code.

   The second way is that variables can be defined to hold certain types of data. Some types of data use less memory than others. For example, a Boolean or TRUE/FALSE variable in VBA requires 2 bytes of memory as compared to a Variant, which can require up to 24 bytes of memory. By defining variables we constrain their memory usage, which can greatly speed up our programs.

Offset Property

A useful property to help with movement through Excel worksheets is the *offset* property. In Chapter 2 we learned the OFFSET function, which starts at a reference point and references another cell depending on the row and column inputs entered. VBA can do a similar process with the offset property. This property works with a Range object. The Range object is the starting reference point. Then two entries are needed: a number for the number of rows to move up or down and a number for the number of columns to move right or left. Here is how this would look in code:

```
Range(''Test'').Offset(1, 5)
```

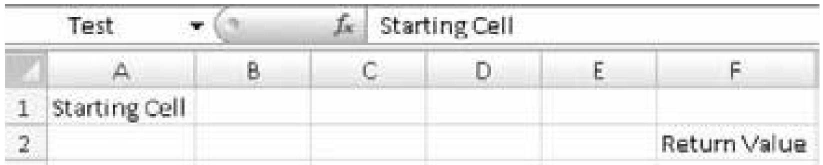


FIGURE 11.8 In the example code, Range("Test").Offset(1, 5), A1, which is named "Test," would be referenced and offset by 1 row and 5 columns. The example code would then equal the value in cell F2.

In this example, the Range object Test would be offset by 1 row and 5 columns. Whatever value is in the cell that is referenced through the offset property will be returned by this section of code. The Excel sheet example is shown in Figure 11.8. We could then load that value into a variable by writing:

```
Variable = Range(''Test'').Offset(1, 5)
```

MODEL BUILDER 11.2: A FIRST LOOK AT LOOPS AND VARIABLES IN VBA

1. To learn about loops and variables in an easy manner, we are going to extend our first code example. In this Model Builder example, we will write code that repeats our name as many times as we like. Go back to the Excel sheet in VBATestCode.xls where the name information was entered. Add the text **# of Rows** in cell A4. Enter the value **1000** in cell A5 and name cell A5 **TotalRows**.
2. Press **Alt-F11** to get to the VBE. In the VBATestCode project, select **Module1**. We will create new code in the same module as in the previous Model Builder, directly underneath the last code created. Enter the code `Sub NameRepeater()` on the line after the previous code's `End Sub`.
3. The first task we should always do when we get more proficient with VBA coding is to declare variables. Declaring variables makes the system aware of the variable name and what type of data can be entered into it. The term for declaring a variable is more technical in VBA. The proper command to use is known as *dimensioning a variable*, which is done with the term *Dim*. Enter the following code on the next line:

```
Dim Name As String
Dim TotalRows As Integer
Dim RowCounter As Integer
```

In this step, we declared three different variables. The first one is called "Name," and it can contain only text, or, in programming terminology, a *string*. The second variable is called "TotalRows," and will contain a number that is indicative of the total number of rows the name will be repeated. The third variable is called "RowCounter," which will be used in the VBA code itself. The idea that a variable can be created just for use in a program causes confusion for some. Variables can be representations of items from the Excel sheet or they can be created only for use in VBA.

4. The second major task of our program is assigning values to the variables. Recall the statement above: "The left side of the equal sign accepts what the right side provides."

   We can apply this same logic to variables. Enter the following code starting on the next empty line in the NameRepeater subroutine:

   ```
   Name = Range("MyName")
   TotalRows = Range("TotalRows")
   ```

   This section of code assigns values from the Excel sheet to the variables. Now the variable Name has the text value from whatever name is entered in cell A2 of the Excel sheet and TotalRows as the numerical value from cell A5.

5. The next line of code that should be entered is:

   ```
   For RowCounter = 1 To TotalRows
   ```

   The wording of this code is something entirely new. This is the initiation of a *For Next* loop. These types of loops are initialized by setting a variable (RowCounter) equal to a value (1) and then performing code that follows this line until a Next statement is reached. After the next statement is reached, the variable increases by an integer of 1. This process continues until the first variable is equal to the second variable after the To statement (TotalRows).

   Informally, I refer to the RowCounter variable as a *counter* variable since it essentially keeps the count of the loop. It is not only convenient that the counter variable keeps the count, but it can be also used for calculation and reference throughout the loop, as we will see.

6. Once we initiate the loop, the next line of code is what gets repeated. Enter the following line of code after the previous one:

   ```
   Range("Destination").Offset(RowCounter, 0) = Name
   ```

   In this line, we use the offset property mentioned earlier. However, there are key differences between this line of code and the example shown earlier. First, the code is reversed from the example. This is because we want a range to equal a variable value, not a variable equaling a range value. The second difference is that we use a variable for the value of the offset, rather than a hard-coded value. This is how we draw upon the power of a loop to "move" through a worksheet.

   Walking through what would happen, the first loop would be initiated and RowCounter would equal 1. The range object Destination would then be offset

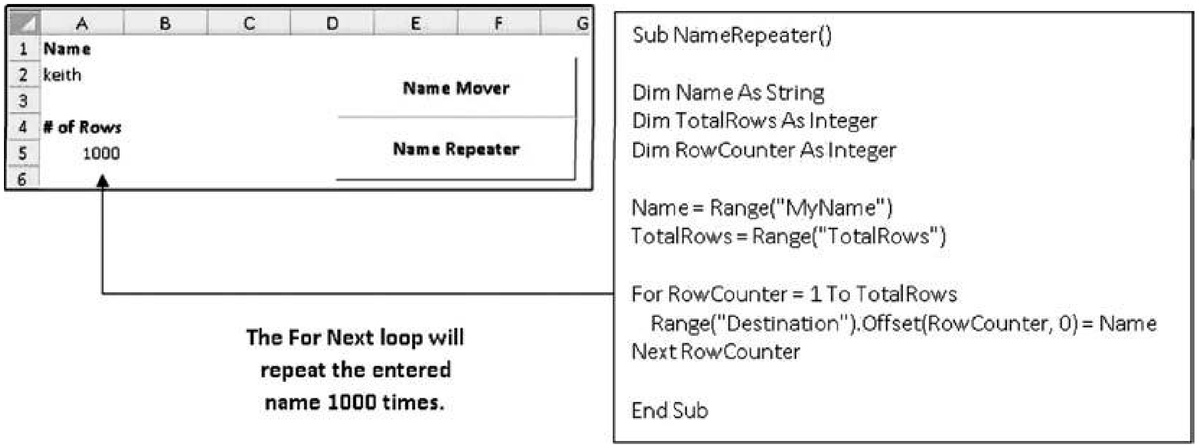


FIGURE 11.9 The code repeats the name in cell A2 for the number of times entered in cell A5.

by 1 row and 0 columns. When the loop gets repeated, RowCounter would increase to 2 and the range object Destination would then be offset by 2 rows and 0 columns.

7. The final key part of the For Next loop is the `Next`. We could just write `Next`, but we should identify the counter variable in case we start using multiple For Next loops. Enter the following code in the next line after the previous line of code:

```
Next RowCounter
```

   This line of code instructs the program to go back up to the start of the For Next loop and begin the process again, unless the counter variable is equal to the value after the `To` statement. Figure 11.9 provides an overview of the code supporting the Excel sheet.

8. Make sure to end the program with a line stating `End Sub`. The final code for this subroutine should read:

```
Sub NameRepeater()
Dim Name As String
Dim TotalRows As Integer
Dim RowCounter As Integer

Name = Range("MyName")
TotalRows = Range("TotalRows")

For RowCounter = 1 To TotalRows
 Range("Destination").Offset(RowCounter, 0) = Name
Next RowCounter

End Sub
```

COMMON ERRORS FOR FIRST-TIME VBA PROGRAMMERS

If your macro did not work in Model Builder 11.1 or 11.2, we need to debug the problem. We can save a lot of time by understanding the most common errors for new programmers. The primary errors include:

- Spelling or inconsistent names
- Going beyond scope
- Forgetting part of a multistep process

Spelling

The number-one error is spelling. You will most likely get the run-time error: '1004:' Method 'Range' of object '_Global' failed. This common error means that you tried to refer to a range object that does not exist. It usually does not exist because the programmer spelled the range object name differently than the name on the Excel sheet. Check the Name Manager names versus the names used in VBA for inconsistencies.

There can also be simple typo problems with spelling. For example, if you misspell `Offset`, such as `Ofset`, the code will break down instantly.

Scope

Another common error is trying to use a value with a variable that is beyond the variable's scope. This means that we could have declared a variable as text and tried to pass a numerical value into it. This generates an error. Also, if we declared a value as an integer and tried to pass the number 1,000,000 through it, we would generate an error since 1,000,000 exceeds the maximum numerical value for an integer (32,767).

Missing Steps

Some VBA techniques are multistep processes and quickly break down if one of those steps is missing. For example, we learned how a basic For Next loop works. If we start a For Next loop with the For section, but forget to insert the Next code, the entire subroutine will break down. There are other similar issues as you learn more about VBA, such as If statements requiring an End If.

VBA WITHIN A FINANCIAL MODELING CONTEXT

The next section of this chapter marks a switch from the introduction of VBA to application. We will focus on three main problems that VBA allows us to overcome:

1. Eliminating circular references
2. Generating multiple scenarios
3. Performing repetitive administrative functions

Each problem will be solved by a Model Builder section that will add functionality to the example model. The circular reference created to balance the balance sheet will be converted to a looping solution, a new scenario generator sheet will be built and run by code, and finally, an Excel/VBA printer solution will be installed to rapidly export results.

MODEL BUILDER 11.3: ELIMINATING CIRCULAR REFERENCES

1. We will take a simple approach to our first macro for use in the example model. To eliminate the need for the circular reference we need to mimic the iterative process that is taking place. Essentially, the circular reference is loading up initial values, calculating, and then loading up the results of the calculation into the same formula. This goes on for a number of iterations. At the most basic level, this could be solved by a person copying and pasting the asset and liability plugs into the plug areas on the balance sheet. Done repetitively, the balance sheet should balance. Prior to actually writing code, we should set up our sheet for the process. The Excel sheet needs are minimal for this subroutine. All we need to do is name the following ranges with the corresponding names:

   'Debt'!E14:J14 = **rng_SurplusOutDS**
   'Balance Sheet'!E31:J31 = **rng_STOut**
   'Balance Sheet'!E48:J48 = **rng_SurplusIn**
   'Balance Sheet'!E49:J49 = **rng_STIn**

2. Press **Alt-F11** to get to the VBE. Insert a module and name it **Iterative**. Modules can be named by left-clicking on the newly inserted module and then going to the Properties Window. There you can enter a name for the module under Name.
3. Start a new subroutine by entering the following code in the Iterative module:

```
Sub Plugs()
```

4. Something you may notice in the example model is green text all over the place. The green text is known as *comments*; these are useful to explain what a subroutine is doing or what specific lines of code intend to accomplish. Comments are not read when the code is run and are purely for the user's knowledge. Comments are entered by starting a line of code with an apostrophe ('). Every new line of code will require its own apostrophe to start the commenting process.
5. The next lines of code will be variable declarations:

```
Dim i As Integer
Dim iteration As Integer
```

These two lines of code create two variables: *i* and iteration. Many programmers tend to use single-letter variables, such as *i*. These are frequently used as counter variables for loops.

6. After the previous line of code, enter:

```
Application.ScreenUpdating = False
```

This is a special command that turns off Excel's screen updating, meaning that as the subroutine runs, nothing will change on the screen even if the code is moving items around in our model. If we did not turn it off, we would see the screen move around as the code ran. Although screen updating does add an impressive "automation" element, it is a waste of memory and slows our programs down.

7. The next two lines of code after turning off screen updating should be:

```
iteration = 100
Calculate
```

Here we assign our iteration variable a value of 100, which will be the total number of times to loop or iterate. We also use a special command called "Calculate," which calculates the entire workbook in case the workbook was last saved with the manual calculation setting turned on.

8. Enter the following line of code:

```
For i = 1 To iteration
```

This line of code initiates a For Next loop. We use the variable *i* as a counter variable and loop through to the number of iterations that are loaded into the iteration variable. In more advanced sheets, we could create a sheet value for the number of iterations and load that value into the iteration variable. For the purposes of this subroutine, 100 iterations is plenty and probably not necessary to adjust.

9. The heart of the code is next:

```
Range("rng_SurplusIn").Copy
Range("rng_SurplusOutDS").PasteSpecial xlPasteValues
Range("rng_STIn").Copy
Range("rng_STOut").PasteSpecial xlPasteValues
```

Every loop copies the surplus cash calculated in the rng_SurplusIn range and pastes only those values into the rng_SurplusOutDS range. Notice that we used the Copy and PasteSpecial methods and that the PasteSpecial method has a qualifier for us to tell VBA the type of special paste that we are looking for. The same process is done for the short-term debt. Refer to Figure 11.10 for additional reference.

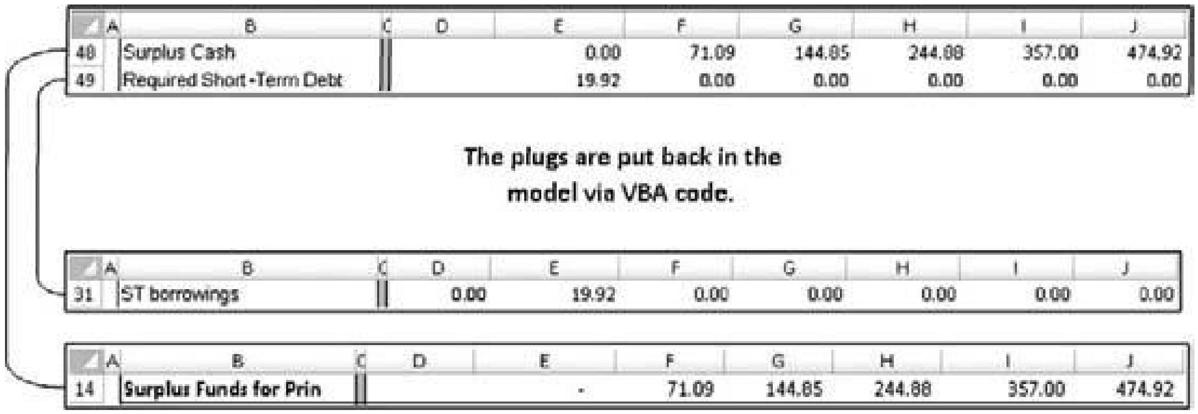


FIGURE 11.10 The plugs' values are copied and pasted using code to avoid having a circular reference in the model.

10. Prior to finalizing the loop, we should make sure the sheet is calculated. Enter the following code to calculate again:

```
Calculate
```

11. One problem with running code, particularly with the screen updating turned off, is that we do not know the progress. This can be accomplished by inserting the following code:

```
 Application.StatusBar = "Solving Assets and Liabilities,
Iteration " _ & i & " of " & iteration
```

As with the screen updating code, we are interested in affecting the Excel application itself. However, in this case we want to change the status bar (the bar on the bottom of Excel that normally states "Ready"). We will have it say our custom text, plus the two variables. The reason we use the two variables is that they will change with each loop and show the model user which loop the code is processing out of the total number of loops. The text and variables are joined together with the & symbol, which works identically to the Excel sheet version.

12. We are finally done with the loop and close it off with the following line of code:

```
Next i
```

Remember that if we forget this simple line of code, the entire subroutine will break down and generate an error.

13. Since we adjusted some of the Excel application's settings we should switch them back to what they were before. Enter the following code:

```
Application.ScreenUpdating = True
Application.StatusBar = False
```

This turns screen updating back on and changes the status bar back to "Ready." Be careful of using a True for the status bar. The default setting is False. If a True is entered in this part of the code, the status bar on the Excel sheet will read "True."

14. Finalize the code with an `End Sub`.

15. The final code should read (note that comments are inserted):

```
Sub Plugs()

' Declare variables
Dim i As Integer
Dim iteration As Integer

Application.ScreenUpdating = False
iteration = 100
Calculate

' Loop through each iteration, replacing the Surplus and ST
       Debt values in with their
' corresponding out areas.
For i = 1 To iteration
       Range("rng_SurplusIn").Copy
       Range("rng_SurplusOutDS").PasteSpecial xlPasteValues
       Range("rng_STIn").Copy
       Range("rng_STOut").PasteSpecial xlPasteValues
       Calculate
       Application.StatusBar = "Solving Assets and Liabili-
             ties, Iteration " _
       & i & " of " & iteration
Next i

Application.ScreenUpdating = True
Application.StatusBar = False

End Sub
```

16. To make it easier to run, create a button on the Assumptions sheet and assign the Plugs subroutine to it. You may want to locate it near cell J3 and name it **Balance Model**.

MODEL BUILDER 11.4: CREATING A SCENARIO GENERATOR

1. The next functionality to implement is the ability to generate multiple results by altering assumptions. Although we could run scenarios by hand, it would take a long time to run a number of variations. In the complete example model there are two sheets dedicated to scenario analysis: Basic Scenarios and Scenarios.

   In this Model Builder we will learn how to create the Basic Scenarios sheet functionality. This sheet and the code behind it accepts multiple sales growth vectors, runs each vector through the model, balances the model, and captures the resulting change on the firm value prior to running the next scenario. The Scenarios sheet in the complete example model will not be covered since it is an advanced version that requires search code.

   The first step in creating the Basic Scenarios functionality is to insert a worksheet after the DCF sheet and name it **Basic Scenarios**.
2. The purpose of the Basic Scenarios sheet is to create an area where we can enter sensitivity vectors. We also need to create formulas that provide data about the scenarios that we anticipate running. Enter the following text in the corresponding cells on the Basic Scenarios sheet:

   A1: **Basic Scenarios**
   B5: **Scenario Data**
   B6: **Scenario #**
   C3: **Number of Periods**
   C6: **Vector**
   F3: **Number of Scenarios**
   K5: **Scenario Results Summary**
   K6: **Scenario #**
   L6: **Firm Value**

3. Carry over the dates from the Vectors sheet to the Basic Scenarios sheet. Start with a reference to the Vectors sheet cell E10 in cell D6 on the Basic Scenarios sheet. Copy and paste that reference over the Basic Scenarios sheet range D6:I6.
4. We will focus on Sales Growth for now. To give us data to work with for each scenario, let's try out 10 scenarios. Copy the scenario data from range B7:I16 on the Basic Scenarios sheet in the complete example model and paste it into the same sheet and range in your model. Do the same for the scenario numbers in range K7:K16. Thus far, the Basic Scenarios sheet should look like Figure 11.11.
5. Two formulas are needed to summarize the number of periods and the number of scenarios in the scenario analysis. Enter the following formulas in the corresponding cells on the Basic Scenarios sheet:

   D3: **=COUNT(D6:I6)**
   H3: **=COUNT(B7:B65536)**

   Name cell D3 **basicscens_VectYears** and cell H3 **basicscens_VectCount**.

Basic Scenarios

Number of Periods	6	Number of Scenarios	10

Scenario Data

Scenario #	Vector	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
1	Sales Unit Growth	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2	Sales Unit Growth	1.00%	1.00%	1.00%	1.00%	1.00%	0.25%
3	Sales Unit Growth	2.00%	2.00%	2.00%	2.00%	2.00%	0.50%
4	Sales Unit Growth	3.00%	3.00%	3.00%	3.00%	3.00%	0.75%
5	Sales Unit Growth	4.00%	4.00%	4.00%	4.00%	4.00%	1.00%
6	Sales Unit Growth	5.00%	5.00%	5.00%	5.00%	5.00%	1.25%
7	Sales Unit Growth	6.00%	6.00%	6.00%	6.00%	6.00%	1.50%
8	Sales Unit Growth	7.00%	7.00%	7.00%	7.00%	7.00%	1.75%
9	Sales Unit Growth	8.00%	8.00%	8.00%	8.00%	8.00%	2.00%
10	Sales Unit Growth	9.00%	9.00%	9.00%	9.00%	9.00%	2.25%

Scenario Results Summary

Scenario #	Firm Value
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

FIGURE 11.11 The first step in creating a powerful VBA scenario generator is creating the control sheet for it in Excel.

6. There are a number of ranges we need to name as reference points throughout the model. This will allow us to navigate the model very easily in VBA. On the Basic Scenarios sheet, name the following cells with the corresponding names:

   C6: **strt_BasicVectorValues**
   L6: **strt_BasicResults1**

7. If we take a moment to remove ourselves from the minutiae and look at our overall plan, we will see that we have a number of possible sales growth vectors that will be run through the model. They will have to be moved to the Vectors sheet using code, but the question arises: Where do we move them—Base Case area? Downside Case area? Instead of using existing areas, which could confuse users, we should make a separate area on the Vector sheet for VBA-generated cases. Go to the Vectors sheet and copy all of the labels and references from the complete example model so that there is a *VBA-generated case* section. This new section should look like Figure 11.12.

VBA Generator Case		Projected ····›				TV Year
	12/31/2007	12/31/2008	12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013
Income Statement Items							
Sales Unit Growth		10.0%	10.0%	10.0%	10.0%	10.0%	4.0%
Sales Price Growth		10.0%	10.0%	10.0%	10.0%	10.0%	4.0%
Cost Unit Growth		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
SGA (% of revenue)		14.0%	14.0%	14.0%	14.0%	14.0%	14.0%
Op Ex (% of revenue)		6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Non-Op Ex (% of revenue)		1.8%	1.8%	1.8%	1.8%	1.8%	1.8%

FIGURE 11.12 A new section on the Vectors sheet accepts the scenario data from the Basic Scenarios sheet. Note that this is a partial screen shot and that there are more rows of data.

8. In order to use the VBA-generator case section on the Vectors sheet, we need to modify lists and formulas. On the top of the Vectors sheet in cell B7, enter the text **VBA Generator Case**. Modify the named range lst_Scenario so that cell B7 is included in that named range. Next go to each CHOOSE formula in the Vectors sheet range E12:J36 and insert a reference for the possibility of the VBA Generator Case. The functionality that is being built in is to have the user select the VBA Generator Case from the Assumptions sheet, which will populate the values from the VBA-generator case section on the Vectors sheet to the live scenario section. The values that are inserted in the VBA-generator case section are modified by the values from the Basic Scenarios sheet. By implementing such a system we allow for both Excel scenario generation and VBA scenario generation, depending on what the user desires. An overview of the process is provided in Figure 11.13.
9. For our Basic Scenarios functionality we will name one cell on the Vectors sheet to make our VBA code easier to write. On the Vectors sheet, name cell D32 **strt_SalesGrowth**. We are now ready to write the necessary code.

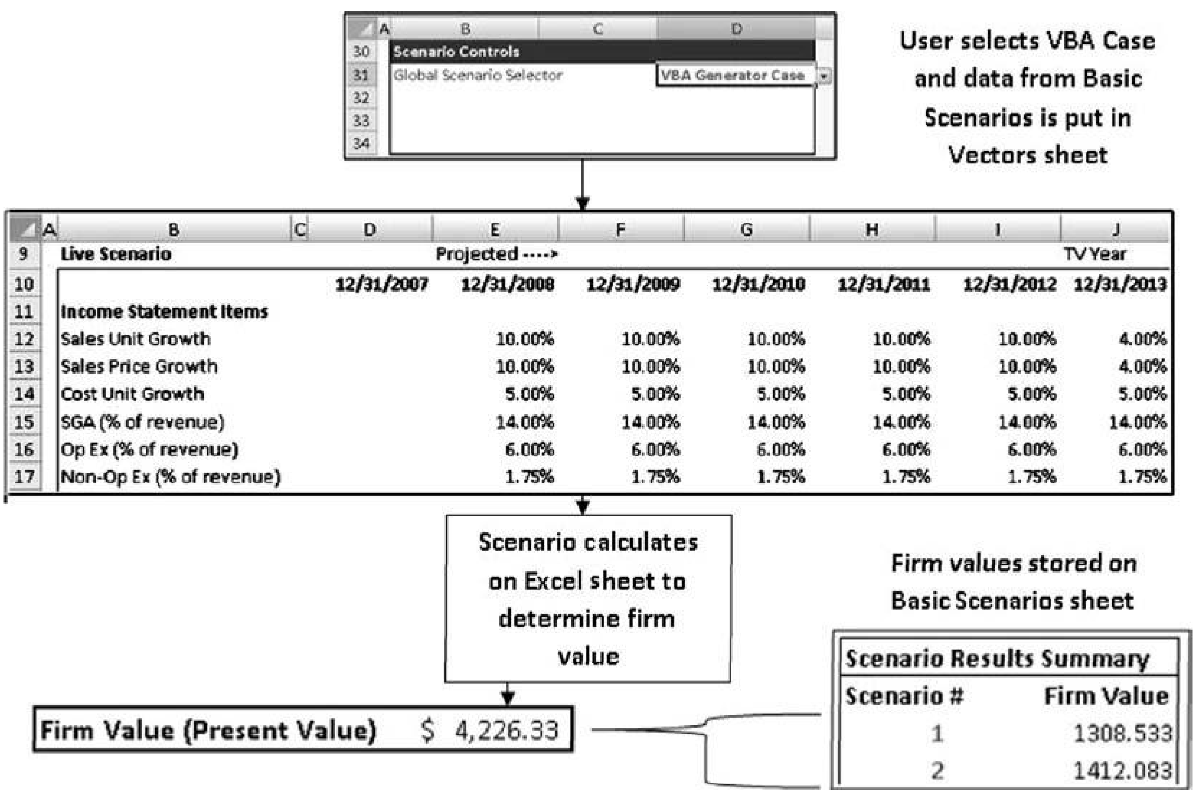


FIGURE 11.13 The Basic Scenarios subroutine utilizes the calculation power of the existing model to quickly return multiple firm values.

10. Press **Alt-F11** to get to the VBE. Insert a new module in your model and name that module **Scenarios**. In that module start a subroutine by entering the following code:

```
Sub BasicScenarioGen()
```

11. Just as in the last subroutine, our first step is to declare variables. Enter the following code after the last line of code:

```
Dim NumScens As Integer
Dim NumPds As Integer
Dim CounterScens As Integer
Dim CounterPds As Integer
```

Notice that we create four variables: one that will represent the total number of scenarios, one that will represent the total number of periods, one that will count the scenarios as we loop through them, and one that will count the periods as we loop through them.

12. Also similar to the last subroutine, we will assign values to certain variables. Enter the following code in the subroutine:

```
NumScens = Range("basicscens_VectCount")
NumPds = Range("basicscens_VectYears")
```

This code takes the values from the Basic Scenarios sheet and loads them into the variables that we created.

13. We will initiate two loops, which is something we have yet to do. This is done because we want to loop through each scenario, but for each scenario we want to loop through each period. Because we will first loop through the scenario, this is known as the *outer* loop; the second loop, the periods, is referred to as the *inner* loop. To start this process enter the following code:

```
For CounterScens = 1 To NumScens
 For CounterPds = 1 To NumPds
```

14. The key to each loop is that for each period within a scenario we want to replicate the value that is on the Basic Scenarios sheet and put it into the VBA generator case section of the Vectors sheet. We will use the same offset property as before to accomplish this. Enter the following code:

```
Range("strt_SalesGrowth").Offset(0, CounterPds) = _
Range("strt_BasicVectorValues").Offset(CounterScens,
CounterPds)
```

One thing that may confuse new programmers is the use of the underscore. Underscores are used to continue a line of code to another line for readability. The functionality is such that this appears to be one line of code to the computer, but since it would be tedious to scroll right to read long lines of code we can continue the same line of code on the next line by inserting a space and an underscore. Do not forget the space prior to the underscore; otherwise, an error will be generated.

Overall, this section of code does what we want. It offsets from a location on the Basic Scenarios sheet and puts the value in the cell that it is referencing into the corresponding period location on the Vectors sheet.

15. The next few steps should be done carefully since it is extremely important what is put prior to the Next statements in our code. We are fine right now to enter the following code after the last two lines of code:

```
Next CounterPds
```

16. However, before entering another Next statement for the scenarios, there are a few things we need to do in between the scenario loop. At this point, we have entered new values in our model, which means that the balance sheet is most likely unbalanced. Instead of relying on the circular reference or rewriting the Plugs subroutine, we can just run the Plugs subroutine from the BasicScenarioGen subroutine. Do this by entering the following line of code:

```
Call Plugs
```

The Call statement calls a subroutine and is followed by the subroutine's name.

17. After we balance the model, we should make sure that everything is calculated and force another calculation of the workbook just in case. While this may be redundant, our processing time is relatively low, so we can enter the following line of code:

```
Calculate
```

18. Now, if we were to loop to the next scenario, we would essentially lose any result from the previous scenario! Although we could pull any number of results from our model, we will keep it simple and focus on the firm value, which is already a named range (outputs_FirmValue). Enter the following code to copy the firm value onto the results section of the Basic Scenarios sheet:

```
Range("strt_BasicResults1").Offset(CounterScens, 0) = _
Range("outputs_FirmValue")
```

19. We can loop to the next scenario to repeat the process for each scenario on the Basic Scenarios sheet. Also remember to make sure that the End Sub statement is there. The last lines of code should be:

```
Next CounterScens
End Sub
```

20. The final code should be:

```
Sub BasicScenarioGen()

' Declare variables

Dim NumScens As Integer
Dim NumPds As Integer
Dim CounterScens As Integer
Dim CounterPds As Integer

' Assign values
NumScens = Range("basicscens_VectCount")
NumPds = Range("basicscens_VectYears")

' Loop through each scenario and replace the Vector sheet
      sales growth vector
' with each scenario's assumption from the Basic Scenarios
      sheet.

For CounterScens = 1 To NumScens
 For CounterPds = 1 To NumPds
 Range("strt_SalesGrowth").Offset(0, CounterPds) = _
 Range("strt_BasicVectorValues").Offset(CounterScens,
      CounterPds)
 Next CounterPds
 Call Plugs
 Calculate
 Range("strt_BasicResults1").Offset(CounterScens, 0) = _
 Range("outputs_FirmValue")
Next CounterScens

End Sub
```

21. For the user to use this code, we should create a button on the Assumptions sheet, beneath the previous button, and assign the BasicScenarioGen subroutine to it. We should name that button **Generate Scenarios**. Also, the user should know that for this functionality to work the VBA Generator Case needs to be selected on the Assumptions sheet in cell D31 (inputs_ScenSelector).

MODEL BUILDER 11.5: AUTOMATIC SHEET PRINTING

1. The final code that will be explained is the *printing* subroutine. The overall goal of this functionality is to have the user select checkboxes on the Assumptions sheet for the sheets in the model that are to be sent to the default printer. Most of this macro is actually controlled by items on the Excel sheets. Figure 11.14

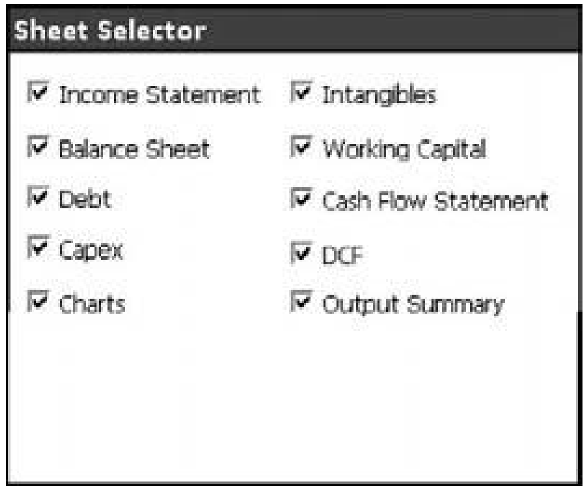


FIGURE 11.14 The automatic sheet printer is primarily controlled by form functionality on the Assumptions sheet.

depicts this section of the Excel sheet. Go to the Assumptions sheet, and enter the text **Sheet Selector** in cell F3.

2. Create a checkbox for each sheet that you anticipate printing in the area beneath cell F3 on the Assumptions sheet. Name each checkbox the same as the sheet name that you are referring to. Go to the Format Control of the first checkbox and make the cell link to cell N4 on the Hidden sheet. Go to the Hidden sheet and notice the pattern of implementation that will emerge. When the checkbox is checked, a TRUE should show up in cell N4; when the same checkbox is unchecked, a FALSE should show up. In cell M4, enter the name of the sheet that corresponds to the name of the sheet that the checkbox is referring to (and that should also be the title of the checkbox). Repeat this process for every sheet that should possibly be printed, continuing down the rows. For instance, the next checkbox should be linked to cell N5 with the name of the sheet in cell M5. This section is shown in Figure 11.15. Once this is done, name the range of sheet names on the Hidden sheet **ctrl_SheetSelector** and cell N3 **strt_SheetNameTFs**. For labeling purposes, enter the text **ctrl_SheetSelector** in cell M3.
3. We should also count the number of possible sheets to print. Still on the Hidden sheet, enter the following formula in cell L15:

   =COUNTA(ctrl_SheetSelector)

   Name L15 ctrl_SheetCt.
4. Notice the functionality that we have built in. For each sheet that could possibly be printed we have a checkbox on the Assumptions sheet. When the user checks

	L	M	N
1			
2			
3	**ctrl_SheetSelector**		
4	Income Statement		TRUE
5	Balance Sheet		TRUE
6	Debt		TRUE
7	Capex		TRUE
8	Intangibles		TRUE
9	Working Capital		TRUE
10	Cash Flow Statement		TRUE
11	DCF		TRUE
12	Charts		TRUE
13	Output Summary		TRUE
14			
15	10		

FIGURE 11.15 The checkboxes are linked to the Hidden sheet, where a list of TRUE or FALSE values will be stored to control the printing subroutine.

one of those boxes, it changes the value of cells on the Hidden sheet to either TRUE or FALSE. We can probably guess that we are going to loop through each of the sheet references on the Hidden sheet to see whether there is a TRUE or FALSE value and print only the sheets that have a TRUE value next to them. Since our code will look at the actual sheet names in the model as it loops through and use the sheet names listed on the Hidden sheet for referencing purposes, it is extremely important that the sheet names listed in ctrl_SheetSelector are identical to the names on the tab of each worksheet.

5. We are now ready to create the code for the printer functionality. Press **Alt-F11** to go to the VBE. Insert a new subroutine and call it **Export_Routines**. Start the subroutine with the following line of code:

```
Sub Printer()
```

6. As we have been doing in the past two Model Builders, the next step is to declare variables. Enter the following code:

```
Dim iSheetCt As Integer, TotalSheets As Integer
Dim SheetNameTemp As String
```

7. Our next step is to assign values to certain variables. In this case, we need only know the total number of sheets to possibly print. To accomplish this task, enter the following code:

```
TotalSheets = Range("ctrl_SheetCt")
```

8. We will initiate a loop for each sheet. Thinking about the process we want to loop through each sheet to possibly print. Start the loop by entering the following code:

```
For iSheetCt = 1 To TotalSheets
```

9. The block of code that is within the loop is the most important. Enter the following code:

```
If Range("strt_SheetNameTFs").Offset(iSheetCt, 0) = True Then
 SheetNameTemp = Range("strt_SheetNames").Offset(iSheetCt, 0)
 Worksheets(SheetNameTemp).PrintOut
    End If
```

This code uses an IF THEN statement, a VBA technique that we have not mentioned yet; however, this is relatively easy to understand given our understanding of the IF function in Excel. An IF THEN statement works very similarly, by testing a conditional test and returning one value if the condition is TRUE and possibly a separate value if it is FALSE (note that this would require also using an ELSE statement, but this is not necessary for this example).

In our subroutine we want to test whether each worksheet name on the Hidden sheet has a TRUE value next to it. If this is TRUE, then we store the name of the worksheet into the SheetNameTemp variable. We then take that name and use it within a Worksheet object. A Worksheet object is similar to a Range object in that it references an object within the Excel application. Rather than referencing just a cell, it is referencing an entire sheet. Once we have referenced the sheet we then use the PrintOut method, which sends the sheet to the default printer. If there is no TRUE next to a sheet name on the Hidden sheet, then nothing gets printed. Finally, this block of code is finished off with an End If statement, which is a required parameter for an IF THEN statement to signify the end of the statement.

10. We finish off the code with a Next statement to repeat the loop so every worksheet name on the Hidden sheet is tested and printed if the conditional test is met. An `End Sub` is also included at the end of the subroutine. The last part of the code should read:

```
Next iSheetCt
End Sub
```

11. The final code for the Printer subroutine should be:

```
Sub Printer()

Dim iSheetCt As Integer, TotalSheets As Integer
Dim SheetNameTemp As String

TotalSheets = Range("ctrl_SheetCt")

For iSheetCt = 1 To TotalSheets
 If Range("strt_SheetNameTFs").Offset(iSheetCt, 0) = True Then
 SheetNameTemp = Range("strt_SheetNames").Offset(iSheetCt, 0)
 Worksheets(SheetNameTemp).PrintOut
 End If
Next iSheetCt
End Sub
```

12. Automate the running of this macro by creating a button on the Assumptions sheet underneath the previous subroutine's button. Name this button **Print Selected Sheets**.

CONTINUING WITH VBA

Learning a new language is a constantly evolving process that takes years to perfect. Computer-based languages are included in this category. Much as new learners of foreign languages limit their usage to certain words and phrases at first, we have limited our VBA language to a core set of statements, objects, properties, and methods that are best suited for financial modeling. Although perhaps not the most efficient or robust techniques, they are easy to learn and powerful when implemented.

There are specific techniques that I would suggest financial modelers learn next. These include:

- More practice with multiple For Next loops
- Learning Do While and Do Until loops
- More practice with IF THEN ELSE statements
- Learning how to create and work with arrays
- Learning how to create and use functions both in VBA and for use in Excel

The list could go on and on, but the techniques above and those discussed in this chapter are very useful for financial modeling application. Be careful as your skill develops not to overuse VBA. The general idea is to use it when you absolutely need it. Otherwise, you risk overcomplicating models and making them difficult for yourself and others to troubleshoot.

CONCLUSION

We have dedicated quite a bit of time to constructing a powerful discounted cash flow model for corporate valuation. Do not stop here. The model captures only as much as we tell it to. This thought was reinforced when I was on a consulting engagement in Dubai. A senior member of a prominent investment bank was giving a speech to his junior staff. One thing he said has stayed with me on every analysis I undertake: "Be thoughtful about the deal."

I took this to mean we should think through each aspect of the deal in detail. This is paramount to corporate transactions since every industry in every region can have a unique set of circumstances requiring thought. Thinking through the deal structure and identifying transaction parties, risks, mitigating factors, market forces, economic situations and so on should be done day-in and day-out until the transaction closes. The financial model will provide an excellent medium for organizing these items and quantifying certain aspects, but by no measure is it an absolute solution.

Financial modeling is about creating a target for business decisions. Occasionally, we will hit a perfect bull's-eye with little effort, but we must focus our energy on nudging the deal process toward the bull's-eye. This requires the ability to think through the intricacies of a transaction and deal with the needs of parties involved to get a deal done. The combination of a thoughtful process with a powerful corporate valuation model will produce transactions where risk and reward are properly structured.

About the CD-ROM

This appendix provides you with information on the contents of the CD that accompanies this book. For the latest-and-greatest information, please refer to the ReadMe file located at the root of the CD.

SYSTEM REQUIREMENTS

- A computer with a processor running at 120 MHz or faster
- At least 32 MB of total RAM installed on your computer; for best performance, at least 64 MB
- A CD-ROM drive

NOTE: Many popular word processing programs are capable of reading Microsoft Word files. However, users should be aware that a slight amount of formatting might be lost when using a program other than Microsoft Word.

Using the CD with Windows

To install the items from the CD to your hard drive, follow these steps:

1. Insert the CD into your computer's CD-ROM drive.
2. The CD-ROM interface will appear. The interface provides a simple point-and-click way to explore the contents of the CD.

If the opening screen of the CD-ROM does not appear automatically, follow these steps to access the CD:

1. Click the **Start** button on the left end of the taskbar and then choose **Run** from the menu that pops up.
2. In the dialog box that appears, type ***d*:\start.exe**. (If your CD-ROM drive is not drive D, fill in the appropriate letter in place of *d*.) This brings up the CD interface described in the preceding set of steps.

Using the CD with Macintosh

To install the items from the CD to your hard drive, follow these steps:

1. Insert the CD into your computer's CD-ROM drive.
2. The CD icon will appear on your desktop; double-click to open.
3. Double-click the **Start** button.
4. Read the license agreement and click the **Accept** button to use the CD.
5. The CD interface will appear. Here you can install the programs and run the demos.

NOTE: Please be aware that Excel 2008 for Mac does not support VBA. Files containing VBA will have reduced functionality when run using Excel 2008.

WHAT'S ON THE CD

The following sections provide a summary of the software and other materials you'll find on the CD.

Content

The included CD-ROM contains the following files that support the text:

- *Corporate_Basic_Model.xls:* This is a complete discounted cash flow model that the user will construct through the Model Builder exercises. It requires a version of Excel 2000 or later and the following add-ins (installation instructions are included in the text):
  - Analysis Tool-Pak
  - Analysis Tool-Pak VBA

  In addition, there are a number of modules containing VBA code stored in Corporate_Basic_Model.xls. This code should be referenced for Chapter 11.
- *GrowthRates.xls* and *GrowthRates_Complete.xls:* These two Excel files are for use in Chapter 3. They provide exercises relating to determining growth rates for analysis. GrowthRates.xls can be opened and directly worked in as it is incomplete and intended for the user to work through. GrowthRates_Complete.xls is the completed version of what the user should complete.
- *VBA_TestCode_Book.xls:* This Excel file is for Chapter 11. It provides a completed version of what Model Builder 11.1 and 11.2 should look like. If any of the text in those sections of Chapter 11 is unclear, readers should refer to this file for the complete versions.

Finally, there is a workbook that corresponds to the Toolbox at the end of Chapter 3:

- *Tool Box Ch.3.xls:* Due to the number of complicated Excel functions in Chapter 3's Toolbox, this Excel file provides examples. Scroll through the tabs for examples dedicated to each function.

Applications

The application *Excel Viewer* is used on the CD. Excel Viewer is a freeware viewer that allows you to view, but not edit, most Microsoft Excel spreadsheets. Certain features of Microsoft Excel documents may not work as expected from within Excel Viewer.

Shareware programs are fully functional, trial versions of copyrighted programs. If you like particular programs, register with their authors for a nominal fee and receive licenses, enhanced versions, and technical support.

Freeware programs are copyrighted games, applications, and utilities that are free for personal use. Unlike shareware, these programs do not require a fee or provide technical support.

GNU software is governed by its own license, which is included inside the folder of the GNU product. See the GNU license for more details.

Trial, demo, or evaluation versions are usually limited either by time or by functionality (such as being unable to save projects). Some trial versions are very sensitive to system date changes. If you alter your computer's date, the programs will time out and no longer be functional.

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To place additional orders or to request information about other Wiley products, please call (877) 762–2974.

About the Author

Keith Allman is the Manager of Analytics and Modeling at Pearl Street Capital Group, where he focuses on private equity fund of funds and venture debt funds. He has been involved in quantitative analytics for nearly 10 years. His first position was with MBIA in their quantitative analytics group, where he modeled corporate securitizations and infrastructure projects. After four years in that role, he moved to Citigroup to model structured products for their conduits and eventually emerging market transactions for their Principal Finance group.

During his tenure in the Principal Finance group, Allman was responsible for valuing large-scale infrastructure projects and whole businesses in order to determine the optimal investment structure. Besides being able to apply standard corporate finance modeling, his background in structured finance allowed him to create unique analyses for companies and projects that exhibited qualities from both sectors. In addition, this framework was developed for specialized work with development banks.

After nearly three years at Citigroup, and upon the publication of his book, *Modeling Structured Finance Cash Flows in Excel: A Step-by-Step Guide* (February 2007, John Wiley & Sons), he formed his own consulting and training firm, named Enstruct. Enstruct has serviced clients worldwide in capital markets and equity valuation, distressed valuation, and quantitative-based training. Enstruct continues to operate worldwide and has a strong client base in emerging markets. Concurrently with consulting and training, Allman produced a second text, *Reverse Engineering Deals on Wall Street: A Step-by-Step Guide* (December 2008, John Wiley & Sons).

Aside from for-profit work, Allman volunteers with Relief International, providing pro bono credit-risk training to microfinance initiatives in the Middle East and assisting in structuring microfinance fund transactions.

Allman received bachelor degrees from UCLA and a master's degree from Columbia University.

Index

For more information regarding the CD-ROM, see the
About the CD-ROM section on page 263.

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Praise for

CORPORATE VALUATION MODELING + CD

"Valuation is regarded as more art than science. Keith has deciphered the complex and technical skills developed over years of investment banking and corporate finance experience into a logical, usable book that I have not seen after years of M&A work. More than a list of formulae, Keith builds the foundations of very robust knowledge of model logic, construction, and customization, while subtly building a library of extremely useful formula combinations and putting the tools in the workshop for you. This is the book I needed ten years ago."
—Adam Quinn, Senior Relationship Manager, Professional Services, St. George Institutional and Corporate Bank, and Chief Investment Officer, TAC Capital Investment and Advisory

"This guide enables the user to set out data and assumptions, understand logic, and deliver results. Once you're in control of your model you can apply different scenarios, stress testing, and become the 'go to person' on a deal."
—Anthony Ditchburn, Associate Director, Financial Institutions Credit, Wholesale Banking, a division of National Australia Bank Limited

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Corporate Valuation Modeling takes you step by step through the process of creating a powerful corporate valuation model. Each chapter skillfully discusses the theory of the concept, followed by Model Builder instructions that inform you of every step necessary to create the template model. Many chapters also include a validation section that shows techniques and implementations that you can employ to make sure the model is working properly. Engaging and informative, this reliable resource:

- Provides a comprehensive, integrated approach to modeling a corporate entity with the primary goal of determining a firm value
- Contains a Tool Box section at the end of each chapter that assists those who may be less skilled in Excel techniques and functions
- Walks you through the full process of constructing a fully dynamic corporate valuation model

KEITH A. ALLMAN is the manager of analytics and modeling at Pearl Street Capital Group. He is also the founder of Enstruct, a quantitative finance training and consulting company. Prior to this, he was a vice president in the Global Special Situations Group at Citigroup. Allman has also worked in Citigroup's Global Securitized Markets division modeling conduit transactions and in MBIA Corporation's Quantitative Analytics group. He is the author of the Wiley titles *Modeling Structured Finance Cash Flows with Microsoft Excel* and *Reverse Engineering Deals on Wall Street with Microsoft Excel*. Allman received a master's degree in international affairs with a concentration in finance and banking from Columbia University and dual bachelor degrees from UCLA.

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