FIFTH EDITION

THE #1 BESTSELLING GUIDE TO

CORPORATE VALUATION

VALUATION

UNIVERSITY EDITION

Measuring *and* Managing *the* Value *of* Companies

Updated *and* Revised *with* New Insights *into* Business Strategy *and* Investor Behavior

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VALUATION

MEASURING AND MANAGING THE VALUE OF COMPANIES

Part One

Foundations of Value

1

Why Value Value?

Value is the defining dimension of measurement in a market economy. People invest in the expectation that when they sell, the value of each investment will have grown by a sufficient amount above its cost to compensate them for the risk they took. This is true for all types of investments, be they bonds, derivatives, bank accounts, or company shares. Indeed, in a market economy, a company's ability to create value for its shareholders and the amount of value it creates are the chief measures by which it is judged.

Value is a particularly helpful measure of performance because it takes into account the long-term interests of all the stakeholders in a company, not just the shareholders. Alternative measures are neither as long-term nor as broad. For instance, accounting earnings assess only short-term performance from the viewpoint of shareholders; measures of employee satisfaction measure just that. Value, in contrast, is relevant to all stakeholders, because according to a growing body of research, companies that maximize value for their shareholders in the long term also create more employment, treat their current and former employees better, give their customers more satisfaction, and shoulder a greater burden of corporate responsibility than more shortsighted rivals. Competition among value-focused companies also helps to ensure that capital, human capital, and natural resources are used efficiently across the economy, leading to higher living standards for everyone. For these reasons, knowledge of how companies create value and how to measure value—the subjects of this book—is vital intellectual equipment in a market economy.

In response to the economic crisis unfolding since 2007, when the U.S. housing bubble burst, several serious thinkers have argued that our ideas about market economies must change fundamentally if we are to avoid similar crises in the future. The changes they propose include more explicit regulation governing what companies and investors do, as well as new economic theories. Our view, however, is that neither regulation nor new theory will prevent future bubbles or crises. The reason is that past ones have occurred largely when companies, investors, and governments have forgotten how investments create value, how to measure value properly, or both. The result has been confusion about which investments are creating real value—confusion that persists until value-destroying investments have triggered a crisis.

Accordingly, we believe that relearning how to create and measure value in the tried-and-true fashion is an essential step toward creating more secure economies and defending ourselves against future crises. That is why this fifth edition of *Valuation* rests on exactly the same core principles as the first.

The guiding principle of value creation is that companies create value by investing capital they raise from investors to generate future cash flows at rates of return exceeding the cost of capital (the rate investors require to be paid for the use of their capital). 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. Companies can sustain strong growth and high returns on invested capital only if they have a well-defined competitive advantage. This is how competitive advantage, the core concept of business strategy, links to the guiding principle of value creation.

The corollary of this guiding principle, known as the conservation of value, says anything that doesn't increase cash flows doesn't create value.[1] For example, when a company substitutes debt for equity or issues debt to repurchase shares, it changes the ownership of claims to its cash flows. However, it doesn't change the total available cash flows,[2] so in this case value is conserved, not created. Similarly, changing accounting techniques will change the appearance of cash flows without actually changing the cash flows, so it won't change the value of a company.

To the core principles, we add the empirical observation that creating sustainable value is a long-term endeavor. 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. 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.

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

[1] Assuming there are no changes in the company's risk profile.
[2] In Chapter 23 we show that the tax savings from debt may increase the company's cash flows.

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 returns on invested capital. Equally, this knowledge will enable investors to calculate the risks and returns of their investments with greater confidence.

CONSEQUENCES OF FORGETTING TO VALUE VALUE

The guiding principle of value creation—the fact that return on invested capital and growth generate value—and its corollary, the conservation of value, have stood the test of time. Alfred Marshall spoke about the return on capital relative to the cost of capital in 1890.[3] When managers, boards of directors, and investors have forgotten these simple truths, the consequences have been disastrous. The rise and fall of business conglomerates in the 1970s, hostile takeovers in the United States in the 1980s, the collapse of Japan's bubble economy in the 1990s, the Southeast Asian crisis in 1998, the Internet bubble, and the economic crisis starting in 2007 can all, to some extent, be traced to a misunderstanding or misapplication of these principles.

Market Bubbles

During the Internet bubble, managers and investors lost sight of what drove return on invested capital; indeed, many forgot the importance of this ratio entirely. When Netscape Communications went public in 1995, the company saw its market capitalization soar to $6 billion on an annual revenue base of just $85 million, an astonishing valuation. This phenomenon convinced the financial world that the Internet could change the way business was done and value created in every sector, setting off a race to create Internet-related companies and take them public. Between 1995 and 2000, more than 4,700 companies went public in the United States and Europe, many with billion-dollar-plus market capitalizations.

Many of the companies born in this era, including Amazon.com, eBay, and Yahoo!, have created and are likely to continue creating substantial profits and value. But for every solid, innovative new business idea, there were dozens of companies (including Netscape) that turned out to have nothing like the same ability to generate revenue or value in either the short or the long term. The initial stock market success of these flimsy companies represented a triumph of hype over experience.

Many executives and investors either forgot or threw out fundamental rules of economics in the rarefied air of the Internet revolution. Consider the concept of *increasing returns to scale*, also known as "network effects" or

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

"demand-side economies of scale." The idea enjoyed great popularity during the 1990s after Carl Shapiro and Hal Varian, professors at the University of California–Berkeley, described it in a book titled *Information Rules: A Strategic Guide to the Network Economy*.[4]

The basic idea is this: In certain situations, as companies get bigger, they can earn higher margins and return on capital because their product becomes more valuable with each new customer. In most industries, competition forces returns back to reasonable levels. But in increasing-returns industries, competition is kept at bay by the low and decreasing unit costs of the market leader (hence the tag "winner takes all" for this kind of industry).

Take Microsoft's Office software, a product that provides word processing, spreadsheets, and graphics. As the installed base of Office users expands, it becomes ever more attractive for new customers to use Office for these tasks, because they can share their documents, calculations, and images with so many others. Potential customers become increasingly unwilling to purchase and use competing products. Because of this advantage, Microsoft made profit margins of more than 60 percent and earned operating profits of approximately $12 billion on Office software in 2009, making it one of the most profitable products of all time.

As Microsoft's experience illustrates, the concept of increasing returns to scale is sound economics. What was unsound during the Internet era was its misapplication to almost every product and service related to the Internet. At that time, the concept was misinterpreted to mean that merely getting big faster than your competitors in a given market would result in enormous profits. To illustrate, some analysts applied the idea to mobile-phone service providers, even though mobile customers can and do easily switch providers, forcing the providers to compete largely on price. With no sustainable competitive advantage, mobile-phone service providers were unlikely ever to earn the 45 percent returns on invested capital that were projected for them. Increasing-returns logic was also applied to Internet grocery delivery services, even though these firms had to invest (unsustainably, eventually) in more drivers, trucks, warehouses, and inventory when their customer base grew.

The history of innovation shows how difficult it is to earn monopoly-sized returns on capital for any length of time except in very special circumstances. That did not matter to commentators who ignored history in their indiscriminate recommendation of Internet stocks. The Internet bubble left a sorry trail of intellectual shortcuts taken to justify absurd prices for technology company shares. Those who questioned the new economics were branded as people who simply "didn't get it"—the new-economy equivalents of defenders of Ptolemaic astronomy.

[4] C. Shapiro and H. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1999).

When the laws of economics prevailed, as they always do, it was clear that many Internet businesses, including online pet food sales and grocery delivery companies, 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.

Financial Crises

Behind the more recent financial and economic crises beginning in 2007 lies the fact that banks and investors forgot the principle of the conservation of value. Let's see how. First, individuals and speculators bought homes—illiquid assets, meaning they take a while to sell. They took out mortgages on which the interest was set at artificially low teaser rates for the first few years but rose substantially when the teaser rates expired and the required principal payments kicked in. In these transactions, the lender and buyer knew the buyer couldn't afford the mortgage payments after the teaser period ended. But both assumed either that the buyer's income would grow by enough to make the new payments or that the house value would increase enough to induce a new lender to refinance the mortgage at similar, low teaser rates.

Banks packaged these high-risk debts into long-term securities and sold them to investors. The securities, too, were not very liquid, but the investors who bought them—typically other banks and hedge funds—used short-term debt to finance the purchase, thus creating a long-term risk for whoever lent them the money.

When the interest rate on the home buyers' adjustable-rate debt increased, many could no longer afford the payments. Reflecting their distress, 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.

This story reveals two fundamental flaws in the decisions made by participants in the securitized mortgage market. They assumed that securitizing risky home loans made the loans more valuable because it reduced the risk of the assets. This violates the conservation of value rule. The aggregated cash flows of the home loans were not increased by securitization, so no value was created, and the initial risks remained. Securitizing the assets simply enabled their risks to be passed on to other owners: some investors, somewhere, had to be holding them. Yet the complexity of the chain of securities made it impossible to know who was holding precisely which risks. After the housing market turned, financial-services companies feared that any of their counterparties could be holding massive risks and almost ceased to do business with one another. This was the start of the credit crunch that triggered a recession in the real economy.

The second flaw was to believe that using leverage to make an investment in itself creates value. It does not, because—referring once again to the conservation of value—it does not increase the cash flows from an investment. Many banks used large amounts of short-term debt to fund their illiquid long-term assets. This debt did not create long-term value for shareholders in those banks. On the contrary, it increased the risks of holding their equity.

Financial crises and excessive leverage As many economic historians have described, aggressive use of leverage is the theme that links most major financial crises. The pattern is always the same: Companies, banks, or investors use short-term debt to buy long-lived, illiquid assets. Typically some event triggers unwillingness among lenders to refinance the short-term debt when it falls due. Since the borrowers don't have enough cash on hand to repay the short-term debt, they must sell some of their assets. The assets are illiquid, and other borrowers are trying to do the same, so the price each borrower can realize is too low to repay the debt. In other words, the borrower's assets and liabilities are mismatched.

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. In the United States in the 1980s, savings and loan institutions funded an aggressive expansion with short-term debt and deposits. When it became clear that these institutions' investments (typically real estate) were worth less than their liabilities, lenders and depositors refused to lend more to them. In 1989, the U.S. government bailed out the industry.

In the mid-1990s, the fast-growing economies in East Asia, including Thailand, South Korea, and Indonesia, fueled their investments in illiquid industrial property, plant, and equipment with short-term debt, often denominated in U.S. dollars. When global interest rates rose and it became clear that the East Asian companies had built too much capacity, those companies were unable to repay or refinance their debt. The ensuing crisis destabilized local economies and damaged foreign investors.

Other financial crises fueled by too much short-term debt have included the Russian government default and the collapse of the U.S. hedge fund Long-Term Capital Management, both in 1998; 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.

Market bubbles and crashes are painfully disruptive, but we don't need to rewrite the rules of competition and finance to understand and avoid them. Certainly the Internet has changed the way we shop and communicate. But it has not created a "New Economy," as the 1990s catchphrase went. On the contrary, it has made information, especially about prices, transparent in a way that intensifies old-style market competition in many real markets. Similarly, the financial crisis triggered in 2007 will wring out some of the economy's recent excesses, such as people buying houses they can't afford and uncontrolled credit card borrowing by consumers. But the key to avoiding the next crisis is to reassert the fundamental economic rules, not to revise them. If investors and lenders value their investments and loans according to the guiding principle of value creation and its corollary, prices for both kinds of assets will reflect the real risks underlying the transactions.

Financial crises and equity markets Contrary to popular opinion, stock markets generally continue to reflect companies' intrinsic value during financial crises. For instance, after the 2007 crisis had started in the credit markets, equity markets too came in for criticism. In October 2008, a *New York Times* editorial thundered, "What's been going on in the stock market hardly fits canonical notions of rationality. In the last month or so, shares in Bank of America plunged to $26, bounced to $37, slid to $30, rebounded to $38, plummeted to $20, sprung above $26 and skidded back to almost $24. Evidently, people don't have a clue what Bank of America is worth."[5] Far from showing that the equity market was broken, however, this example points up the fundamental difference between the equity markets and the credit markets. The critical difference is that investors could easily trade shares of Bank of America on the equity markets, whereas credit markets (with the possible exception of the government bond market) are not nearly as liquid. This is why economic crises typically stem from excesses in credit rather than equity markets.

The two types of markets operate very differently. Equities are highly liquid because they trade on organized exchanges with many buyers and sellers for a relatively small number of securities. In contrast, there are many more debt securities than equities because there are often multiple debt instruments for each company and even more derivatives, many of which are not standardized. The result is a proliferation of small, illiquid credit markets. Furthermore, much debt doesn't trade at all. For example, short-term loans between banks and from banks to hedge funds are one-to-one transactions that are difficult to buy or sell. Illiquidity leads to frozen markets where no one will trade or where prices fall to levels far below a level that reflects a reasonable economic value. Simply put, illiquid markets cease to function as markets at all.

During the credit crisis beginning in 2007, prices on the equity markets became volatile, but they operated normally for the most part. The volatility reflected the uncertainty hanging over the real economy. (See Chapter 17 for more on volatility.) The S&P 500 index traded between 1,200 and 1,400 from January to September 2008. In October, upon the collapse of U.S. investment bank Lehman Brothers and the U.S. government takeover of the insurance

[5] Eduardo Porter, "The Lion, the Bull and the Bears," *New York Times*, October 17, 2008.

company American International Group (AIG), the index began its slide to a trading range of 800 to 900. But that drop of about 30 percent was not surprising given the uncertainty about the financial system, the availability of credit, and their impact on the real economy. Moreover, the 30 percent drop in the index was equivalent to an increase in the cost of equity of only about 1 percent,[6] reflecting investors' sense of the scale of increase in the risk of investing in equities generally.

There was a brief period of extreme equity market activity in March 2009, when the S&P 500 index dropped from 800 to 700 and rose back to 800 in less than one month. Many investors were apparently sitting on the market sidelines, waiting until the market hit bottom. The moment the index dropped below 700 seemed to trigger their return. From there, the market began a steady increase to about 1,100 in December 2009. Our research suggests that a long-term trend value for the S&P 500 index would have been in the 1,100 to 1,300 range at that time, a reasonable reflection of the real value of equities.

In hindsight, the behavior of the equity market has not been unreasonable. It actually functioned quite well in the sense that trading continued and price changes were not out of line with what was going on in the economy. True, the equity markets did not *predict* the economic crisis. However, a look at previous recessions shows that the equity markets rarely predict inflection points in the economy.[7]

BENEFITS OF FOCUSING ON LONG-TERM VALUE

There has long been vigorous debate on the importance of shareholder value relative to other measures of a company's success, such as its record on employment, social responsibility, and the environment. In their ideology and legal frameworks, the United States and the United Kingdom have given most weight to the idea that the objective function of the corporation is to maximize shareholder value, because shareholders are the owners of the corporation who elect the board of directors to represent their interests in managing the corporation's development. In continental Europe, an explicitly broader view of the objectives of business organizations has long been more influential. In many cases, this is embedded in the governance structures of the corporate form of organization. In the Netherlands and Germany, for example, the board of a large corporation has a duty to support the continuity of the business and to do that in the interests of all the corporation's stakeholders, including employees and the local community, not just its shareholders. Similar philosophies underpin corporate governance in other continental European countries.

[6] Richard Dobbs, Bin Jiang, and Timothy Koller, "Why the Crisis Hasn't Shaken the Cost of Capital," *McKinsey on Finance*, no. 30 (Winter 2009): 26–30.
[7] Richard Dobbs and Timothy Koller, "The Crisis: Timing Strategic Moves," *McKinsey on Finance*, no. 31 (Spring 2009): 1–5.

In much of Asia, company boards are more likely than in the United States and Europe to be controlled by family members, and they are the stakeholders whose interests will set the direction of those companies.

Our analysis and experience suggest that for most companies anywhere in the world, pursuing the creation of long-term shareholder value does not cause other stakeholders to suffer. We would go further and argue that companies dedicated to value creation are more robust and build stronger economies, higher living standards, and more opportunities for individuals.

Consider employee stakeholders. A company that tries to boost profits by providing a shabby work environment, underpaying employees, and skimping on benefits will have trouble attracting and retaining high-quality employees. With today's more mobile and more educated workforce, such a company would struggle in the long term against competitors offering more attractive environments. While it may feel good to treat people well, it is also good business.

Value-creating companies also create more jobs. When examining employment, we found that the U.S. and European companies that created the most shareholder value in the past 15 years have shown stronger employment growth. In Exhibit 1.1, companies with the highest total returns to shareholders (TRS) also had the largest increases in employment. We tested this link within individual sectors of the economy and found similar results.

An often-expressed concern is that companies that emphasize creating value for shareholders have a short time horizon that is overly focused on accounting earnings rather than revenue growth and return on invested capital. We disagree. We have found a strong positive correlation between long-term shareholder returns and investments in research and development

EXHIBIT 1.1 **Correlation between Total Returns to Shareholders (TRS) and Employment Growth**

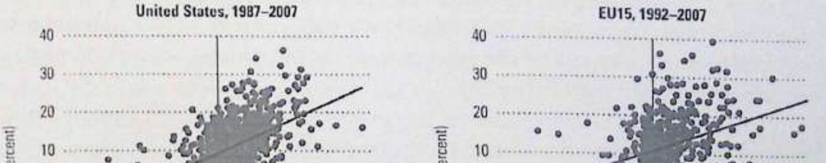
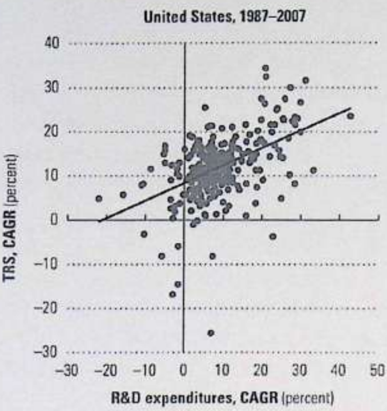


EXHIBIT 1.2 **Correlation between TRS and R&D Expenditures**



(R&D)—evidence of a commitment to creating value in the longer term. As shown in Exhibit 1.2, companies that earned the highest shareholder returns also invested the most in R&D. These results also hold within individual sectors in the economy.

Companies that create value also tend to show a greater commitment to meeting their social responsibilities. Our research shows that many of the corporate social responsibility initiatives that companies take can help them create shareholder value.[8] For example, IBM provides free Web-based resources on business management to small and midsize enterprises in developing economies. Helping build such businesses not only improves IBM's reputation and relationships in new markets, but also helps it develop relationships with companies that could become future customers. And Best Buy has undertaken a targeted effort to reduce employee turnover among women. The program has helped women create their own support networks and build leadership skills. As a result of the program, turnover among female employees decreased by more than 5 percent.

CHALLENGES OF FOCUSING ON LONG-TERM VALUE

Focusing on return on invested capital and revenue growth over the long term is a tough job for executives. They can't be expected to take it on unless they are sure it wins them more investor support and a stronger share price. But as later chapters will show, the evidence is overwhelming that investors

[8] Sheila Bonini, Timothy Koller, and Philip H. Mirvis, "Valuing Social Responsibility Programs," *McKinsey on Finance*, no. 32 (Summer 2009): 11–18.

do indeed value long-term cash flow, growth, and return on invested capital, and companies that perform well on those measures perform well in the stock market. The evidence also supports the corollary: companies that fail to create value over the long term do less well in the stock market.

Yet despite the evidence that shareholders value value, companies continue to listen to misguided supposed truths about what the market wants and fall for the illusion of the free lunch—hoping, for example, that one accounting treatment will lead to a higher value than another, or some fancy financial structure or improvement in earnings per share will turn a mediocre deal into a winner.

To illustrate, when analyzing a prospective acquisition, the question most frequently posed is whether the transaction will dilute earnings per share (EPS) over the first year or two. Given the popularity of EPS as a yardstick for company decisions, you would think that a predicted improvement in EPS would be an important indicator of whether the acquisition was actually likely to create value. However, there is no empirical evidence linking an increased EPS with the value created by a transaction (see Chapter 21 for the evidence). 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? We recently participated in a discussion with a company pursuing a major acquisition and its bankers about whether the earnings dilution likely to result from the deal was important. To paraphrase one of the bankers, "We know that any impact on EPS is irrelevant to value, but we use it as a simple way to communicate with boards of directors."

Yet company executives say they, too, don't believe the impact on EPS is so important. They tell us they are just using the measures the Street uses. Investors also tell us that a deal's short-term impact on EPS is not that important for them. In sum, we hear from almost everyone we talk to that a transaction's short-term impact on EPS does not matter, yet they all pay attention to it.

As a result of their focus on short-term EPS, major companies not infrequently pass up value-creating opportunities. In a survey of 400 CFOs, 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.[9] 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.

From 1997 to 2003, a leading company consistently generated annual EPS growth of between 11 percent and 16 percent. That seems impressive until you look at measures more important to value creation, like revenue growth.

[9] John R. Graham, Cam Harvey, and Shiva Rajgopal, "The Economic Implications of Corporate Financial Reporting," *Journal of Accounting and Economics* 40 (2005): 3–73.

During the same period, the company increased revenues by only 2 percent a year. It achieved its profit growth by cutting costs, usually a good thing, and the cost cutting certainly did produce productivity improvements in the earlier years. However, as opportunities for those ran out, the company turned to reductions in marketing and product development to maintain its earnings growth. In 2003, its managers admitted they had underinvested in products and marketing and needed to go through a painful period of rebuilding, and the stock price fell.

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 irrational 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.

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.

REVIEW QUESTIONS

1. What are the benefits of a long-term perspective on value creation? For companies? For the economy?
2. What is the relationship between the stock market and the real economy in terms of measures such as gross domestic product (GDP), inflation, and interest rates?
3. What are some of the common features of the 2007–2009 stock market crash and previous market crashes—for example, Japan's in the 1990s or the Internet bubble around the turn of the millennium?

4. If growth is a significant value driver, does getting bigger translate into creating value?
5. What are some of the differences between the ways the equity and credit markets operate?
6. Provide examples of businesses where network effects would or would not apply.
7. What more could be done by boards of directors and shareholders to ensure that managers pursue long-term value creation?
8. Explain the conservation of value principle. What decisions might it affect?

2

Fundamental Principles of Value Creation

In Chapter 1, we introduced the fundamental principles of corporate finance. Companies create value by investing capital to generate future cash flows at rates of return that exceed their cost of capital. The faster they can grow and deploy more capital at attractive rates of return, the more value they create. The mix of growth and return on invested capital (ROIC)[1] relative to the cost of capital is what drives the creation of value. A corollary of this principle is the conservation of value: any action that doesn't increase cash flows doesn't create value.

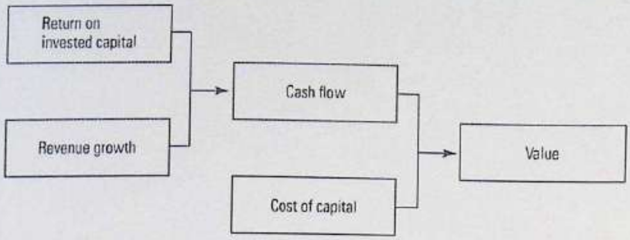
The principles imply that a company's primary task is to generate cash flows at rates of return on invested capital greater than the cost of capital. Following these principles helps managers decide which investments will create the most value for shareholders in the long term. The principles also help investors assess the potential value of alternative investments. Managers and investors alike need to understand in detail what relationships tie together cash flows, ROIC, and value; what consequences arise from the conservation of value; and how to factor any risks attached to future cash flows into their decision making. These are the main subjects of this chapter. The chapter concludes by setting out the relationships between cash flows, ROIC, and value in the key value driver formula—the equation underpinning discounted cash flow (DCF) valuation in both theory and practice.

GROWTH AND ROIC: DRIVERS OF VALUE

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

[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 Chapters 6 and 7.

EXHIBIT 2.1 **Growth and ROIC Drive Value**



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 later in this chapter, a company's return on invested capital and its revenue growth together determine how revenues are converted to cash flows. That means the amount of value a company creates is governed ultimately by its ROIC, revenue growth, and of course its ability to sustain both over time. Exhibit 2.1 illustrates this core principle of value creation.[2]

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 Walgreens, with sales of $54 billion in 2007, and global chewing-gum maker Wm. Wrigley Jr. Company, with sales of $5 billion the same year, earned similar shareholder returns between 1968 and 2007.[3] These two successful companies had very different growth rates. During the period, the net income of Walgreens grew at 14 percent per year, while Wrigley's net income grew at 10 percent per year. Even though Walgreens was one of the fastest-growing companies in the United States during this time, its average annual shareholder returns were 16 percent, compared with 17 percent for the significantly slower-growing Wrigley. The reason Wrigley could create slightly more value than Walgreens despite 40 percent slower growth was that it earned

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

a 28 percent ROIC, while the ROIC for Walgreens was 14 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 4 will demonstrate, returns on invested capital can vary considerably, even between companies within the same industry.

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 tightly linked. To see how, consider two companies, Value Inc. and Volume Inc., whose projected earnings and 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 Volume Inc. obtains from the same level of profits.

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
Revenue	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**

$ millions

	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

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 company—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.

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 revenues and 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:

$$\text{Investment Rate} = \text{Growth} \div \text{Return on Invested Capital}$$

Applying that formula to Value Inc.,

$$25\% = 5\% \div 20\%$$

[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.

EXHIBIT 2.4 **Translating Growth and ROIC into Value**

Value,[1] dollars

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 3%.

Applying it to Volume Inc.,

$$50\% = 5\% \div 10\%$$

Since the three variables are tied together, you only need two to know the third, so you can describe a company's performance with any two of the variables.

Balancing ROIC and Growth to Create Value

Exhibit 2.4 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, we're assuming a 9 percent cost of capital and a company that earns $100 in the first year.[5]

Using this simple approach, we get real-world results. Take the typical large company, which grows at about 5 to 6 percent per year (nominal), earns about a 13 percent return on equity, and has a 9 percent cost of capital. Finding the intersection of the typical company's return leads you to a value of $1,500 to $1,600. Dividing this value by earnings of $100 results in a price-to-earnings ratio of 15 to 16 times—and 15 times is the median P/E for large U.S. companies outside of a recession.

[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.

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 necessarily destroys value, making the point where ROIC equals the cost of capital the dividing line between creating and destroying value through growth. On the line, value is neither created nor destroyed, regardless of how fast the company grows.

We sometimes hear the argument that even low-ROIC companies should strive for growth, because 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.

Real-World Evidence

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 Wrigley were the same even though earnings for Walgreens grew much faster. General Electric (GE) provides another example of the relative impact of growth and ROIC on value. GE's share price increased from about $5 in 1991 to about $40 in 2001, earning investors $519 billion from the increase in share value and distributions during the final 10 years of Jack Welch's tenure as CEO. A similar amount invested in the S&P 500 index would have returned only $212 billion.

How did GE do it? Its industrial and finance businesses both contributed significantly to its overall creation of value, but in different ways. Over the 10-year period, the industrial businesses increased revenues by only 4 percent a year (less than the growth of the economy), but their ROIC increased from about 13 percent to 31 percent. The finance businesses performed in a more balanced way, demonstrating growth of 18 percent per year and increasing ROIC from 14 percent to 21 percent. In the industrial businesses, ROIC was the key driver of value, while in the financial businesses, improvements in both growth and ROIC contributed significantly to value creation.

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 high earnings multiples because of their high returns on invested capital.

The typical large packaged-goods company increased its revenues only 6 percent a year from 1998 to 2007, slower than the average of about 8 percent for all large U.S. companies. Yet at the end of 2007 (before the market crash), the median P/E of consumer packaged-goods companies was about 20, compared with 17 for the median large company. The high valuation of companies in this sector rested on their high ROICs—typically above 20 percent, compared with ROICs averaging 13 percent for the median large company between 1998 and 2007.

Another example that underlines the point is a comparison of Campbell Soup Company ($8 billion in 2008 revenues) with fast-growing discount retailer Kohl's (revenues of $16 billion in 2008). In the middle years of the decade, revenues for Kohl's grew 15 percent annually, while Campbell achieved only 4 percent in annual organic growth. Yet the two companies had similar P/Es. Campbell's high ROIC of 50 percent made up for its slower growth; Kohl's ROIC averaged only 15 percent.

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 the more developed Asian countries of Hong Kong, South Korea, Taiwan, and Singapore.[6] Some executives assume the reason is that investors are simply willing to pay higher prices for U.S. companies (an assumption that has prompted some non-U.S. companies to consider moving their share listing 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 16 percent ROIC in 2007, while the median large Asian company earned 10 percent. Of course, these broad comparisons hide the fact that some Asian sectors and companies—for example, Toyota in automobiles—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 Chapters 15 and 16.

Managerial Implications

We'll dive more deeply into the managerial dimensions of ROIC and growth in Chapters 4 and 5, respectively. For now, we outline several lessons managers should learn for strategic decision making.

Start by referring back to Exhibit 2.4, 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, while low-ROIC companies will generate relatively more value by focusing on increasing their ROIC.

[6] The median large company in the United States had a market-to-book ratio of 2.4 in 2007, while the median large company in these four Asian countries had a median market-to-book ratio of about 1.8.

EXHIBIT 2.5 **Increasing Value: Impact of Higher Growth and ROIC**

Source: McKinsey Corporate Performance Center analysis

For example, Exhibit 2.5 shows that a typical high-ROIC company, such as a branded consumer packaged-goods company, can increase its value by 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.

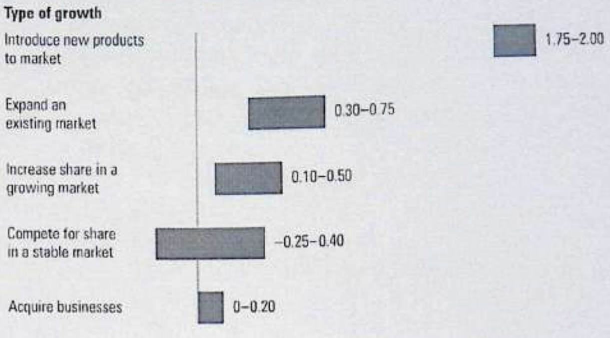
Until now, we have assumed that all growth earns the same ROIC and therefore generates the same value, but this is clearly unrealistic: different types of growth earn different degrees of return so not all growth is equally value-creating. Each company must understand the pecking order of growth-related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

Exhibit 2.6 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, but we believe they reflect the broader reality.[7] 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

[7] 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 2.6 **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.

Source: McKinsey Corporate Performance Center analysis.

the difference between these extremes is differences in ROICs for the different types of investment.

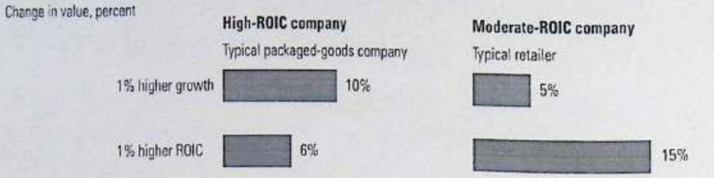
Growth strategies based on organic new product development frequently have the highest returns because they don't require much new capital; companies can add new products to their existing factory lines and distribution systems. Furthermore, the investments to produce new products are not all required 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 30 percent operating margins and a 50+ percent ROIC, 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

EXHIBIT 2.5 **Increasing Value: Impact of Higher Growth and ROIC**



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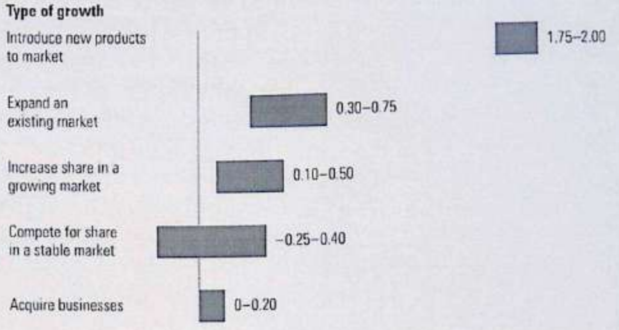

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The interaction between growth and ROIC is a key factor to consider when assessing the likely impact of a particular investment on a company's overall ROIC. For example, we've found that some very successful, high-ROIC companies in the United States are reluctant to invest in growth if it will reduce their ROICs. One technology company had 30 percent operating margins and a 50+ percent ROIC, 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 a 25 percent return opportunity would still create value as long as the cost of capital was lower, despite the resulting decline in average ROIC.

The evidence backs this up. We examined the performance of 78 high-ROIC companies (greater than 30 percent ROIC) from 1996 to 2005.[8] 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. 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 for 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 companies that had low growth but increased their ROICs outperformed the faster-growing companies that did not improve their ROICs.

CONSERVATION OF VALUE

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—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.[9] While the validity of this principle is 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.

[8] Bin Jiang and Timothy Koller, "How to Choose between Growth and ROIC," *McKinsey on Finance* (Autumn 2007): 19–22.

[9] 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 23 for further discussion.

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,[10] 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. One respected analyst said to 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 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 Richard Brealey and Stewart Myers's seminal textbook, *Principles of Corporate Finance*.[11] One of the earliest

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

[11] Richard Brealey, Stewart Myers, and Franklin Allen, *Principles of Corporate Finance*, 9th ed. (New York: McGraw-Hill/Irwin, 2007).

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.[12]

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 only matters 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 of the past decade, 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. 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 16.

[12] 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.

Managerial Implications

The conservation of value principle is so useful because it tells 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 (Chapter 16), acquisitions (Chapter 21), corporate portfolio decisions (Chapter 19), dividend payout policy (Chapter 23), and capital structure (also Chapter 23). 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 23 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 fewer than 10 percent were share repurchases, but since 1998, about 50 to 60 percent of total distributions have been share repurchases.[13]

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 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.

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

Some argue that management should repurchase shares when its 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 that sold) to the shareholders that did not sell. So the holding shareholders may have benefited, but the shareholders as a whole were not affected. Buying 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.

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 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 21 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.

When Johnson & Johnson 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 (maker of skin care products) in 1994 for $924 million. With new-product development, coupled with an expansion of the brand's presence outside the United States, J&J was able to increase Neutrogena's sales from $281 million to $778 million by 2002. Exhibit 2.7 shows the extent of the new products J&J introduced under the Neutrogena brand.

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

EXHIBIT 2.7 **How Johnson & Johnson Turbocharged Neutrogena's Growth**

Product launches	Launch year 1994–1996	1997–1999	2000–2002
Men			• Complete men's product line
Cosmetics			• "Dermatologist Developed" line with 85+ SKUs
Hair products		• New line under "Clean" sub-brand	
Sun protection	• No-stick sunscreen • SPF hand treatment	• Transparent sunscreen	• Healthy Defense brand
Body care	• Rainbath brand (relaunch) • Norwegian Formula foot cream brand	• Body Clear brand	
Facial care			
Acne	• On-the-Spot brand acne treatment	• Multivitamin acne treatment • Oil-free acne treatment	
Moisturizers	• Healthy Skin Care brand	• Light night moisturizer products	• Visibly Firm brand
Cleansers	• Clear Pore treatment • Deep Clean, Deep Pore brands	• Extra Gentle brand • Pore Refining brand	• SkinClearing brand

Source: McKinsey Corporate Performce Center analysis.

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 is even a term for this: "multiple expansion" in the United States or "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 lower–P/E company 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.

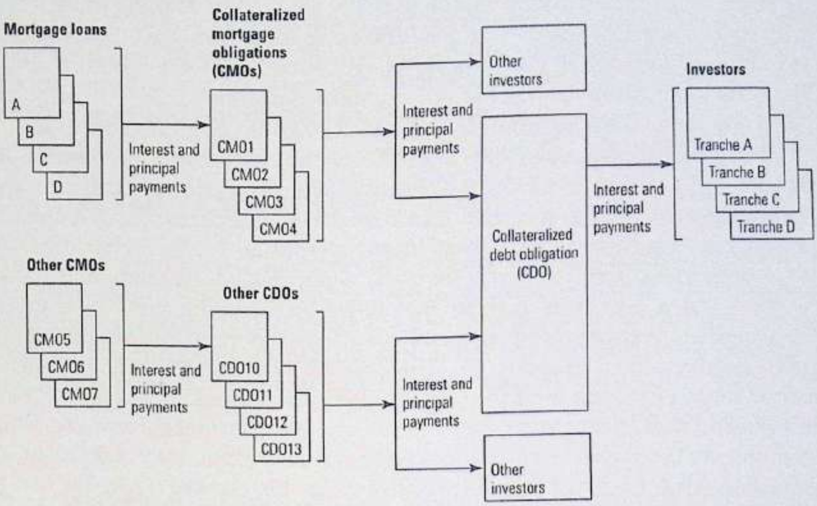
Every corporate leader must know this. So why are we discussing such obvious fallacies? The answer is that companies often do justify acquisitions using this flawed logic. Our alternative approach is simple: if you can't point to specific sources of increased cash flow, the stock market won't be fooled.

Financial engineering Another area where the value conservation principle is important is financial engineering, which unfortunately has no standard definition. Cornell University offers a concentration in financial engineering, which it calls "the design, analysis, and construction of financial contracts to meet the needs of enterprises." For our purposes, we define financial engineering a bit more broadly 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

EXHIBIT 2.8 **Cash Flows Related to Collateralized Debt Obligations**



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, as an example of questionable financial engineering, consider the collateralized debt obligations (CDOs) that contributed to the 2007–2009 financial crisis. This is the story of how a good idea taken too far almost destroyed the financial markets.

Here's how a CDO works. The sponsor of a CDO (typically a bank) creates a new legal entity called a special-purpose vehicle (SPV) that buys up a lot of loans. These loans can be corporate loans, mortgage loans, or even other CDOs. The new legal entity then issues debt securities that will be paid off by the cash flows from the loans in the SPV's portfolio.

Exhibit 2.8 illustrates the cash flows related to a CDO. Reading from left to right in the top portion of the exhibit, individual homeowners pay interest and principal to their mortgage servicer, which forwards it to an SPV that has issued collateralized mortgage obligations (CMOs). That entity pays interest and principal to its investors, which could include a CDO entity that, in turn, pays principal and interest to the various CDO investors. But the total cash flows received by the investors cannot be more than they would receive if they directly owned the loans and securities; in fact, due to fees and transaction costs, the total cash flow to the CDO holders must be lower than the cash flows from the underlying loans.

One key benefit of a CDO is that it allows banks to remove assets from their balance sheets by selling them to investors (through the CDO), thereby freeing up some of the banks' equity capital to make new loans. Making more loans, with their associated transaction fees, increases the banks' cash flows. CDOs worked well for over 20 years, doing exactly what they were intended to do. The early CDOs were pools of home mortgages that allowed banks to originate loans and then take them off their books so they could originate more loans.

But the CDOs issued in 2005 and 2006 were different and fundamentally flawed. Unlike the early CDOs, the new ones were exceptionally complex and nontransparent. For instance, new CDOs might include slices of CDOs already issued, creating nested products as interwoven as an M. C. Escher drawing (as shown in Exhibit 2.8). Even the most sophisticated investors and banks couldn't assess their risks. Instead, they relied on the rating agencies to grade the securities, because rating agencies have access to more information about credit products than investors do. The problem was that the rating agencies earned large fees from the banks (both sellers and buyers of CDOs) for their ratings, and they didn't want the banks to take their business elsewhere. With no money of their own at stake, the rating agencies pronounced many of these securities AAA or AA, the safest securities. In this elaborate process, pools of risky subprime loans came to be deemed AAA-rated securities. But that violated the conservation of value principle: the actual risks and cash flows attached to subprime loans hadn't changed at all, so the total risk of the CDOs could not have been reduced by the securitization process.

When homeowners with subprime mortgages started to miss payments in 2006 and to default, housing prices fell. Investors then realized that the CDOs and CMOs were riskier than they had thought, so they rushed to sell their stakes. The CDOs and CMOs became impossible to sell. However, investors and banks that owned these securities had often financed them with short-term debt that had to be renewed every month or quarter (or sometimes daily). Their creditors, seeing that the value of their collateral (the CDOs and CMOs) had dropped, would not refinance the short-term debt as it came due. The banks and the investors holding the CDOs had no other options but to sell the assets at fire-sale prices, go out of business, or get a government bailout.

You might ask why the banks were so exposed: wasn't the idea that they were just creating these CDOs, not actually investing in them? But they *were* investing. Indeed, when the market turned, the banks were caught with three types of risky inventory: loans they hadn't yet been able to package into CDOs and securitize; the riskiest tranches of CDOs, which they hadn't been able to sell after creating them; and long-term CDOs they had bought themselves because they believed they could finance these CDOs with cheap short-term debt and make a profit.

Banks sometimes marketed CDOs by proposing that they created additional investment opportunities for investors. However, this argument doesn't hold up to scrutiny. The claim was that investors liked CDOs because they yielded higher returns than other similarly rated securities. In other words, the yield on an AA-rated CDO was higher than an AA-rated corporate bond. But if these CDOs were rated the same as corporate bonds, why did they have higher yields? The answer, which we know from hindsight, is that they were riskier—and the market knew they were riskier, even if the rating agencies didn't. The market saw through the illusion.

RISK AND VALUE CREATION

A company's future cash flows are unknown and therefore risky, so to complete our discussion of value creation, we need 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

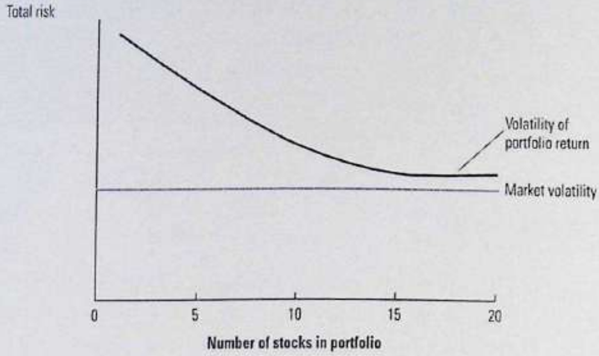
The cost of capital is the price charged by investors for bearing the risk that the company's future cash flows may differ from what they anticipate when they make the investment. The cost of capital to a company equals the minimum return that investors expect to earn from investing in the company. That is why the terms *expected return to investors* and *cost of capital* are essentially the same. The cost of capital is also called the discount rate, because you discount future cash flows at this 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 late 2009 for a large nonfinancial company was about 9 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 2.9 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.

EXHIBIT 2.9 **Volatility of Portfolio Return: Declining with Diversification**



The risks they cannot diversify 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 11). 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. Anyway, when returns on capital across companies vary from less than 5 percent to more than 30 percent, a one or two 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 on the total cash flows from any potential investment.

Cash Flow Risk

The risk that companies must identify and manage is their cash flow risk, meaning uncertainty about their future cash flows. Finance theory is, for the most part, silent about how much cash flow risk 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 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 generates 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. But following the theory could be problematic.

What if 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 in 2009 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. 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 will wipe out all the equity of the company, not just the $15 billion invested in the plant.

We can extend the theory 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, they 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 the company's 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 the earlier 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 generalize. The general rule is to avoid hedging the first type of risk, but hedge the second if you can.

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 non-home 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 Heineken's 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 critical to Heineken's survival, while the other global brewers probably would not benefit from hedging, because the impact of exchange rate changes on their business is not material.

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 drivers of value, ROIC, and revenue growth. As a bridge between the theoretical explanation of those drivers 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. We first introduce 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.
- *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 11.
- *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.[14]

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):[15]

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

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 gives the key value driver formula:

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

This formula underpins the 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 6.

[14] 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.

[15] 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.

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:

Company	$NOPLAT_{t=1}$	Growth (percent)	ROIC (percent)	WACC (percent)	Value
Volume Inc.	100	5	10	10	1,000
Value Inc.	100	5	20	10	1,500

We call the key value driver formula the "Tao of corporate finance" because it relates a company's value to the fundamental drivers of economic value: growth, ROIC, and the cost of capital. You might go so far as to say that this formula represents all there is to valuation. Everything else is mere detail.

However, 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 discounted cash flow (DCF) valuation. We can also 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:

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

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:

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

Divide both sides by invested capital:[16]

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

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 14 for a discussion of how to analyze earnings multiples.

SUMMARY

This chapter showed 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. The corollary is that any management action that does not increase cash flow does not create value. These are the principal lessons of valuation and corporate finance. 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. The concepts governing the theory of valuation based on discounted cash flows are expressed mathematically in the key value driver formula.

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

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

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

REVIEW QUESTIONS

1. How does return on invested capital (ROIC) affect a company's cash flow? Explain the relationship between ROIC, growth, and cash flow.
2. If value is based on discounted cash flows, why should a company or investor analyze growth and ROIC?
3. Under what circumstances does growth destroy value?
4. Which type of business, a software company or an electric utility, would benefit more from improving ROIC than from increasing growth? Why?
5. Why does organic growth often create more value than growth from acquisitions? Describe how different types of organic growth might create different amounts of value.
6. What is the conservation of value principle? Provide some examples of where it might apply.
7. Under what circumstances would changing a company's capital structure affect its value?
8. What is financial engineering? When does it create value?
9. Apply the conservation of value principle to acquisitions.
10. How do diversifiable and nondiversifiable risks affect a company's cost of capital?
11. How should a company decide which risks to hold and which to hedge?
12. How much cash flow risk should a company take on? How should it manage risks with extreme outcomes that could potentially bankrupt the company but are very unlikely to occur?

3

The Expectations Treadmill

The performance of a company and that of its management are frequently measured by 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. 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 very long periods of more than 10 years at least. 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 satisfy those expectations and continue improving 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 contributed to the measure as a whole. However, improved operations constitute the only part of the measure that creates long-term value 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 lightweight 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 then examines the mechanics of TRS, linking them to the core principles of value creation. We propose a more fundamental approach to analyzing TRS that isolates the amount dependent on improvements in return on invested capital (ROIC) and revenue growth—the true drivers of value creation, as we saw in Chapters 1 and 2. Managers, boards of directors, and investors can learn much more about company performance from this more granular decomposition 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. The chapter ends by showing how traditional TRS *can* work as a performance measure, but only in comparison with the TRS performance of a company's peers in its sector.

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 getting faster.

Consider the case of Theresa Turnaround, a fictional character based on the experience of many CEOs we know. 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.[1]

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

[1] 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.

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 risky major 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.

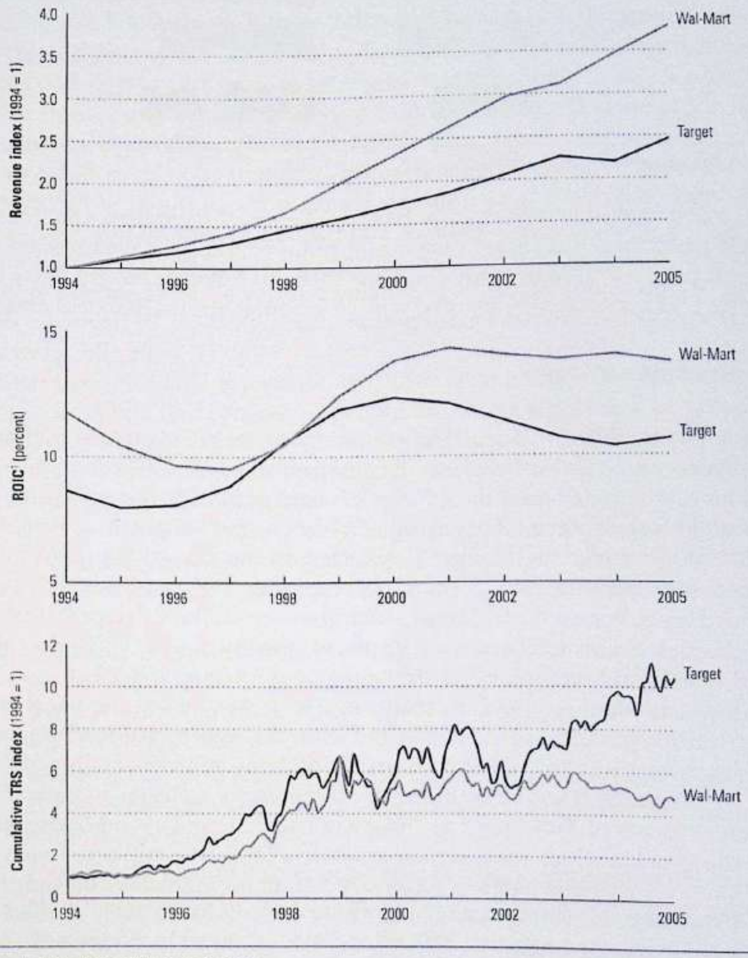
The expectations treadmill is the dynamic behind the adage that a good company and a good investment may not be the same. In the short term, good companies may not be good investments, because future great performance might already be built into the share price. Smart investors often prefer weaker-performing 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

Wal-Mart and Target are two of the largest retailers in the world, with 2008 sales of $403 billion and $65 billion respectively. From 1995 through 2005, Wal-Mart outperformed Target on the key value drivers, growth and ROIC, but Target's shareholders earned higher returns. Exhibit 3.1 shows the revenue growth and return on invested capital for Wal-Mart and Target, as well as total returns to shareholders (stock price appreciation plus dividends). Wal-Mart's sales grew 13 percent per year, compared with Target's 9 percent, and Wal-Mart also earned a higher ROIC throughout the period. Yet Wal-Mart investors earned an annualized return to shareholders of only 15 percent per year, compared with Target's much higher return of 24 percent per year.

The expectations treadmill explains the mismatch between TRS and the underlying value created by the two companies. Using price-to-earnings ratios (P/Es) as a proxy for market expectations, Wal-Mart's P/E at the beginning of 1995 was 15 times, compared with only 11 for Target (see Exhibit 3.2). By the beginning of 2006, Wal-Mart's P/E had increased slightly to 16 times, while Target caught up with and overtook Wal-Mart, reaching 18 times.

EXHIBIT 3.1 **Wal-Mart vs. Target: Wal-Mart Ahead on Growth, ROIC, Not TRS**



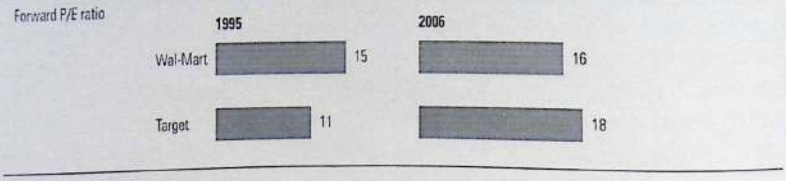
[1] 3-year rolling ROIC without goodwill, adjusted for leases.

Source: McKinsey Corporate Performance Center analysis.

Relative to Wal-Mart, Target was starting from a position of low shareholder expectations. The company's low P/E in 1995 reflected serious concerns about its Mervyn's brand, which was struggling to perform. Target eventually sold its Mervyn's and Marshall Field's brands, after which it beat expectations—thereby raising expectations of its future performance.

Which retailer did a better job? You can make arguments both ways: Target succeeded in turning its business around, and Wal-Mart succeeded in

EXHIBIT 3.2 **Wal-Mart vs. Target: P/E Increase Helps Target's TRS**



Source: McKinsey Corporate Performance Center analysis

delivering against very high expectations. TRS might have been a fair measure of the performance of Target's managers, but it would not have reflected what a great job the Wal-Mart team did. For TRS to give deeper insight into a company's true performance, we need a more granular approach to 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 changes in TRS, they are better able to evaluate management. For example, it's important to know that Wal-Mart's TRS, though lower than Target's, reflected strong underlying performance against high expectations. Second, decomposing TRS can help with setting future targets. For example, Target's managers are unlikely to repeat their high TRS, because that would probably require raising the company's P/E far above the P/Es of Wal-Mart and other strong retailers, 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 P/E:[2]

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

[2] 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.

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 each is associated with different returns on capital and therefore generates a different cash flow. For example, growth from acquisitions may reduce future dividends because of the large investments required to make acquisitions.

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. Similarly, if a company manages to pay a higher dividend by forgoing attractive investment opportunities, then future dividends will suffer.

Last, 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.

For an approach to decomposing TRS that gives clearer insight into how much of the measure derives from changes in operational performance, break up the TRS equation into four parts:

1. The value generated from revenue growth net of the capital required to grow: This figure reflects improvements in margins and capital productivity. It shows how a company's operating performance changes over a given period of time.
2. What TRS would have been without any of the growth measured in part 1: This reflects the company's stock market valuation at the beginning of the measurement period.[3]
3. Changes in shareholders' expectations about the company's performance, measured by the change in its P/E or other earnings multiple.
4. The impact of financial leverage on TRS.

Exhibit 3.3 uses the financials of a hypothetical company to compare the two TRS decomposition approaches. 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 the four parts just

[3] TRS assuming no growth can also be called the earnings yield, as it is calculated as the inverse of a company's P/E or enterprise-value-to-EBITA ratio.

EXHIBIT 3.3 **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 (percent)	–	14.4

Decomposition of TRS

percent	Traditional	Enhanced
Growth	7.0	7.0
Required investment	–	(5.6)
TRS from performance	7.0	1.4
Zero-growth return	–	10.0
Change in P/E	3.0	3.0
Dividend yield	4.4	–
TRS (percent)	14.4	14.4

outlined. 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 what the TRS would have been with zero growth and if investors had not changed their expectations.

The next example shows the impact of debt financing on the TRS decomposition. Consider Company B, which is identical to Company A except for its debt financing. As detailed in Exhibit 3.4, 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 zero-growth returns, growth, and changed expectations measured by the unlevered P/E (enterprise value/earnings), shows that the first three parts of the company's

EXHIBIT 3.4 **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
P/E (multiple)	8.0	8.4
TRS (percent)	–	18.0

Decomposition of TRS

percent	Traditional	Enhanced
Growth	7.0	7.0
Required investment	–	(5.6)
TRS from performance	7.0	1.4
Zero-growth return	–	10.0
Change in P/E[2]	5.5	3.0
Impact of financial leverage	–	3.6
Dividend yield	5.5	–
TRS (percent)	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).

EXHIBIT 3.5 **Wal-Mart vs. Target: TRS Decomposition**

1995–2005, percent annualized

	Target	Wal-Mart	Difference
Revenue growth	9	13	(4)
Investment for growth	(5)	(3)	(2)
Change in margin	4	–	4
TRS from performance	8	10	(2)
Zero-growth return	6	4	2
Change in P/E	5	–	5
Imapct of financial leverage	5	2	3
Other	–	(1)	1
Sum	24	15	9

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 3.5 returns to the comparison of Wal-Mart and Target, showing the TRS decomposition for the two retailers. While Target's 24 percent annual TRS was higher than Wal-Mart's 15 percent, Wal-Mart outperformed Target on the fraction of TRS derived from operating performance by achieving 10 percent to Target's 8 percent. Wal-Mart's revenue growth rate of 13 percent was higher than Target's rate of 9 percent, while Target's increasing margin beat Wal-Mart's relatively constant margin. Clearly, better performance in one domain by one company was offset by better performance in another domain by the other company.

Target outperformed Wal-Mart on the expectations and financial leverage components; indeed, these components accounted for 1 percent more than Target's 9 percent overall outperformance on TRS. Target's TRS assuming no future growth was higher than Wal-Mart's by two percentage points, because at the beginning of the measurement period, Target's P/E was only 11, while Wal-Mart's was 15. This would convert to a lower TRS for Wal-Mart even if neither company grew at all and their multiples remained the same. Because investors paid less for a dollar of Target's earnings in 1995, Target's existing (no-growth) earnings generate a higher yield than Wal-Mart's existing earnings.

Target's P/E increased from 11 to 18 times in 2005, generating 5 percent annual TRS, while Wal-Mart's P/E increased only slightly, generating less than 1 percent TRS (rounded to zero), indicating what a powerful boost to TRS rising shareholder expectations can provide when a company is on its way up.

Target had a further three percentage point advantage in TRS due to higher financial leverage. Target used much more debt than Wal-Mart in 1995, with a debt-to-capital ratio of 48 percent, compared with 21 percent for Wal-Mart. But Target's higher leverage in 1995 was probably not sustainable, and in fact, Target eventually reduced its debt substantially.

Leverage has a multiplier effect on TRS relative to underlying economic performance. In other words, because of Target's higher leverage, a 1 percent increase in revenues has a greater impact on Target's profits and share price than the same increase for Wal-Mart has on its share price. As we discuss in Chapter 23, 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 four-part 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, Wal-Mart and Target had similar expectations built into their share prices (based on similar multiples), and those expectations were near the long-term averages for companies sharing their performance characteristics. Therefore, the opportunity to improve future TRS by continuing to increase expectations had already gone for Target, as had the higher-leverage option, since its capital structure had become similar to Wal-Mart'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 beginning 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 2007 averaged 11 percent a 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 7 percent per year over the period.

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 $132 billion in January 1999 to $80 billion in January 2004. 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 its organic growth was 11 percent—a large enough management challenge to maintain, even without considering that the retail industry doesn't have a track record in 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 Wal-Mart and Target, the sizable differences in TRS for the two companies from 1994 to 2005 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 recent 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.

A few companies have already moved to share-based compensation systems that are tied to relative performance. In 2001, General Electric granted CEO Jeffrey Immelt a performance award based on the company's TRS relative to the TRS of the S&P 500 index. We hope more companies will follow in that direction.

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, then 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,[4] movements that are nothing more than random. Therefore, executives shouldn't even try to understand

[4] 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.

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.

REVIEW QUESTIONS

1. What is the total returns to shareholders (TRS) figure and why is it important?
2. What is the expectations treadmill and how does it affect managers' ability to deliver above-average TRS over long periods of time?
3. What are the potential reasons why TRS over short periods of time may not reflect the actual performance of a company and its management?
4. What actions (good and bad) might managers take when investors have already-high expectations and managers desire to outperform peers on TRS?
5. Do all of the current investors in a company (e.g., Target) earn the same return on capital from their investment? Give reasons for your answer.
6. If a company performs perfectly in line with expectations, how will its TRS react in theory? How will its TRS react in practice? Why?
7. Can Company A outperform Company B on all key value drivers (e.g., growth and ROIC) but still deliver lower TRS? How?
8. Why is the old way of decomposing TRS (into changes in earnings, changes in P/E, and dividend yield) not the best way to understand a company's performance?
9. In the recommended approach to decomposing TRS, explain the theory behind the zero growth return. What is it? What drives it?
10. Given that TRS is not a clean measure of management performance and is therefore a flawed basis for management compensation, how should a company gauge management performance? What measures should it use?

4

Return on Invested Capital

When executives, analysts, and investors assess a business's potential to create value, they sometimes overlook the fundamental principle of value creation—namely, that the value of a business depends on its return on invested capital (ROIC) and growth. As Chapter 2 explains, the higher a company can raise its ROIC and the longer it can sustain a rate of ROIC greater than its cost of capital, the more value it will create. So being able 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 in 2000 between eBay and Webvan, which were both 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, while Webvan soon disappeared. This is not so surprising when we look at the implications of their underlying strategies for their respective ROICs.

EBay's core business 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 started, as more buyers use eBay it attracts more sellers, in turn attracting 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 competitors, the grocery stores. 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 analyze the data, presenting 45 years of evidence on trends in ROIC. This analysis shows how ROIC varies by industry, and how rates of ROIC fluctuate or remain stable over time.

DRIVERS OF RETURN ON INVESTED CAPITAL

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

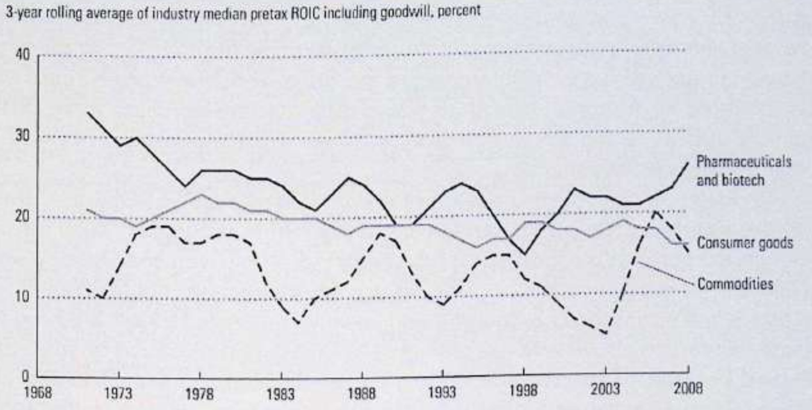
$$\text{ROIC} = (1 - \text{Tax Rate})\frac{\text{Price per Unit} - \text{Cost per Unit}}{\text{Invested Capital per Unit}}$$

This version of ROIC has a similar meaning to the traditional definition, NOPLAT divided by invested capital. To highlight the potential sources of competitive advantage, however, we disaggregate the ratio into posttax revenue minus cost divided by 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,

[1] We introduce *units* to motivate a discussion surrounding 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 4.1 **Company Profitability: Industry Matters**



Source: Compustat, McKinsey Corporate Performance Center analysis.

this framework was not widely influential in business until Michael Porter published *Competitive Strategy* in 1980, applying the model to company 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: threat of new entry, pressure from substitute products, bargaining power of buyers, bargaining power 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 4.1 underlines the importance of industry structure to ROIC. It compares the returns on invested capital over the past 38 years in three sectors: pharmaceuticals, consumer goods, and commodities. Pharmaceutical companies have outperformed both consumer goods and commodity-based companies. The returns for commodity-based companies go up and down significantly with the business cycle, but rarely reach the levels of consumer goods companies.

The reason for this difference in the industries' performances lies mainly in differences between their competitive structures. Pharmaceutical companies can develop innovative products that are subsequently protected by

[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.

long-lasting patents. In the consumer goods industry, companies such as Procter & Gamble and Unilever have developed long-lasting brands that make it difficult for new competitors to gain a foothold. The companies also tend to compete for shelf space on factors other than just price. In contrast, commodity-based companies have undifferentiated products and few opportunities for innovation; for example, almost all paper mills use the same machines. This makes it difficult for any competitor to charge a price premium or build a sustainable cost advantage.

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 Korea's entry into the U.S. market) and because unionized plants are hard to close. Nevertheless, Toyota has managed to earn 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).

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 the leaders today were not necessarily major players 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 related to cost and capital efficiency (see Exhibit 4.2). It is important to understand that competitive advantage derived from these sources is enjoyed not by

EXHIBIT 4.2 **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	

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.

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 part because of its ability to lock customers into its products, and this ability 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 or an inexpensive DVD, 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 business, because the products are so 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 Innovative goods and services yield high returns on capital if they are protected by patents, 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, there is some price stickiness for the patent holder.)

An example of an innovative product line that is not patent protected but just difficult to copy is 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 is the same for all competitors. The iPod is more successful, however, because of its appealing design and ease of use afforded by its user interface and integration with iTunes. 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 were going 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 case of Coca-Cola, Perrier, Lacoste, 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 very 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 stents, 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 stent, 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.

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

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.

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. For example, 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 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 1965 to 2007. 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 Hewlett-Packard'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. A typical example would be a mine whose ore is richer than most other ore bodies. Take two nickel-mining companies, Norilsk Nickel, which produces nickel in northern Siberia, and Vale, which produces nickel in Canada and Indonesia. The content of precious metals (e.g., palladium) in Norilsk's nickel ore is significantly higher than in Vale's. In other words, Norilsk gets not only nickel from its ore but also some high-priced palladium. As a result, Norilsk earned a pretax ROIC of 67 percent in 2007, compared with Vale's nickel division generating 25 percent. (Note that 2007 was a year of high nickel prices.)

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—as for, say, cement or salt—producers near their customers have a unique advantage.

Economies of scale The notion of economies of scale is often misunderstood as meaning 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 airtime and space in Chicago is the same whether you have one store or 10.

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 gets their benefit only if the required investments in scale are large enough to deter competitors. Anyone who wants to compete with UPS or FedEx, for instance, must first pay the enormous fixed expense of installing a nationwide network, 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 Inc., 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 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/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, Inc. (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 additional 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, which 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.

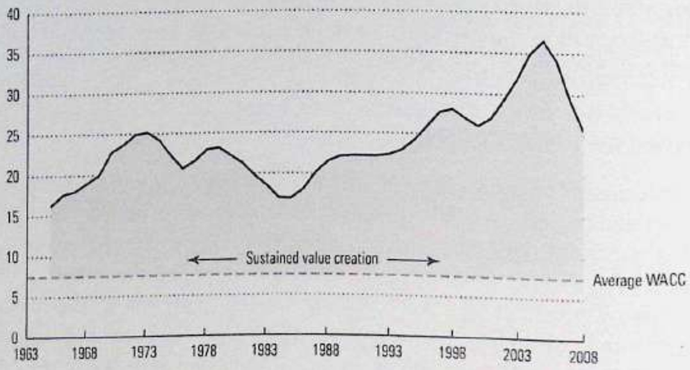
Some companies, such as Procter & Gamble and Johnson & Johnson, are able to protect their primary product lines while simultaneously expanding into new markets. Procter & Gamble has a strong record of continuing to introduce successful new products like Swiffer, Febreze, and Crest Whitestrips. It also 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 $19.5 billion from 1999 to 2008. This enabled the company to advance from owning just one billion-dollar brand (by sales) in 1999 to eight in 2008.

Johnson & Johnson similarly has earned strong returns on capital through its patented pharmaceuticals and branded consumer products lines, such as Tylenol and Johnson's Baby Shampoo. Through strong brands and capable distribution, the company has been able to maintain a price premium in the face of new entrants and alternative products. The company broadened its product portfolio to include medical devices and diagnostics in response to the strength of the health care industry and its expected growth as the baby boomers age. Exhibit 4.3 shows that Johnson & Johnson has maintained an ROIC greater than its weighted average cost of capital (WACC) over the past decades. In fact, the strength of health care in the 1990s has meant returns have risen since the 1980s. Only the Tylenol tampering scare of the 1980s and the high cost of acquisitions in the late 1990s temporarily dampened the company's strong performance.

As we will see later in 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

EXHIBIT 4.3 **Johnson & Johnson: ROIC, 1965–2008**

Rolling three-year average ROIC including goodwill, percent



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.

EMPIRICAL ANALYSIS OF RETURNS ON INVESTED CAPITAL

In this section, we present evidence on rates of ROIC for more than 5,000 U.S.-based nonfinancial companies since 1963. Our results come from McKinsey & Company's Corporate Performance Center database, which relies on financial data provided by Standard & Poor's Compustat. Our key findings are as follows:

- The median ROIC between 1963 and 2008 was around 10 percent and remained relatively constant throughout the period. ROIC does, however, vary dramatically across companies, with only half of the observed ROICs between 5 percent and 20 percent.
- ROICs differ by industry but not by company size. Industries that rely on sustainable competitive advantages such as patents and brands (for example, pharmaceuticals and personal products) tend to have high median ROICs (15 to 20 percent), whereas companies in basic industries, such as paper, airlines, and utilities, tend to earn low ROICs (5 to 10 percent).
- There are large variations in rates of ROIC between and within industries. Some industries earn higher median returns than others, but the spread between the best and worst performers within an industry can be significant. There are examples of companies earning attractive returns

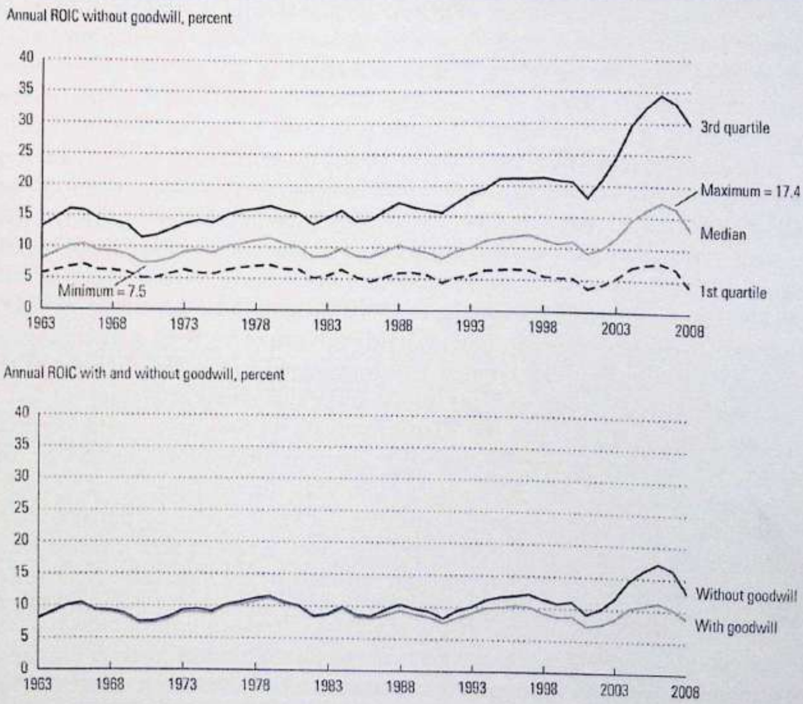
in industries where the median return is low (e.g., Wal-Mart and Intel), and vice versa.

- 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 decade. Individual company ROICs gradually tend toward their industry medians over time but are fairly persistent. Two-thirds of companies that earned ROICs greater than 20 percent in 1995 were still earning at least 20 percent 10 years later.

ROIC Trends

To analyze historical corporate performance, we first measured median ROIC for each of the past 45 years. Exhibit 4.4 plots median ROIC between 1963

EXHIBIT 4.4 **U.S.-Based Nonfinancial Companies: ROIC, 1963–2008**



Source: Compustat, McKinsey Corporate Performance Center analysis.

and 2008 for U.S.-based nonfinancial companies.[4] ROIC is presented with and without goodwill, the difference showing the impact of mergers and acquisitions.

The average median ROIC without goodwill over these years equals about 10 percent, with annual medians oscillating in a relatively tight range between 7 and 11 percent, except during the years between 2005 and 2008. The oscillation is not random, but tied directly to the overall growth of the economy: Regressing median ROIC against gross domestic product (GDP) showed that a 100-basis-point increase in GDP growth translated into a 20-basis-point increase in median ROIC.

Stripping out the four high-inflation years, the median ROIC for the sample tends to be about two percentage points higher than the median cost of capital, which is around 8 percent. This may appear counterintuitive, given the increase in productivity over the past 45 years: The U.S. Department of Labor reports manufacturing workers were approximately 3.5 times more productive in 2003 than they were in 1963. But healthy competition has done its job of transferring the benefits from internal productivity improvements to customers and employees in the form of lower prices and higher salaries, instead of adding to corporate profits.

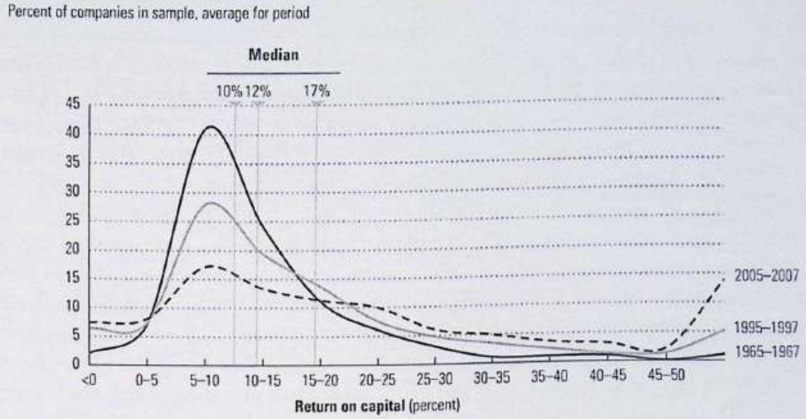
Until about 2004, median ROICs were stable, and a company only had to earn a return greater than 10 percent to be in the top-performing half of the sample, and toward 20 percent to be in the top quartile. In recent years, however, a company had to earn a return on capital near 20 percent to be above the median, and a return above about 25 percent to be in the top quartile.

While returns on invested capital without goodwill have been increasing, returns on invested capital with goodwill have been flat, as shown in the bottom half of Exhibit 4.4. 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, 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 21.)

The story is similar for the distribution of returns on invested capital. Exhibit 4.5 shows the distribution of returns in 1965–1967 overlaid on the returns in 1995–1997 and 2005–2007. Note that the distribution is wide for all periods, with most companies earning between 5 and 20 percent ROIC over the past 45 years. However, there has been a recent shift toward more companies earning very high returns on capital. In the 1960s, only 1 percent of companies earned returns greater than 50 percent, whereas in the early 2000s,

[4] 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 4.5 **Distribution of ROIC: Shifting to the Right**



Source: Compustat, McKinsey Corporate Performance Center analysis.

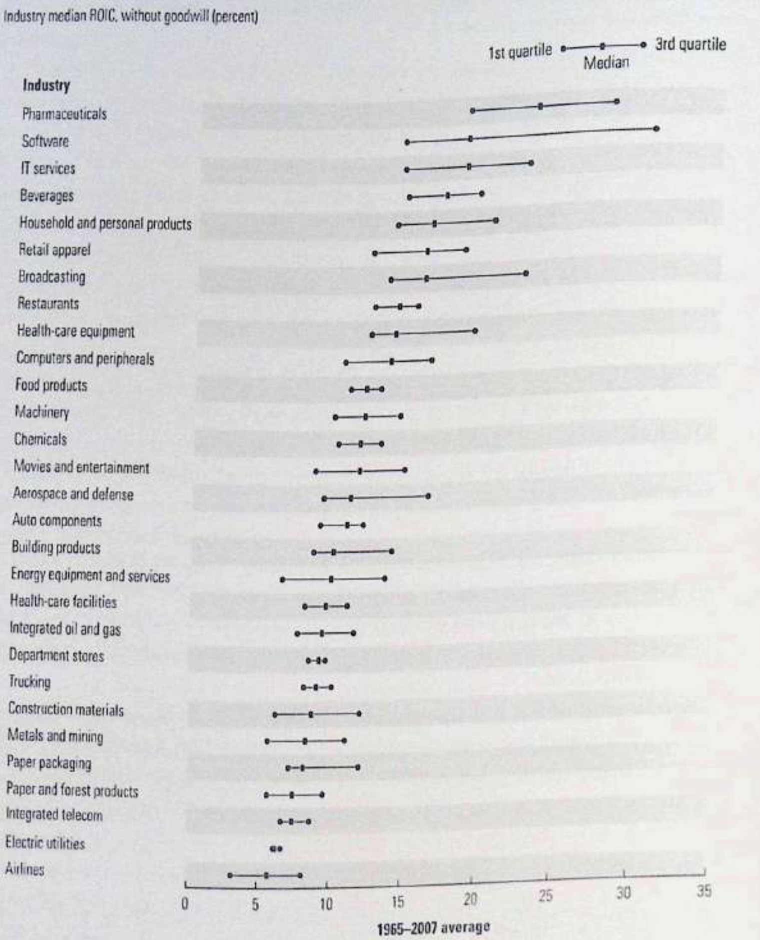
14 percent of companies earned returns of that magnitude. In many cases, this improvement has occurred in industries with strong barriers to entry, such as patents or brands where gains that companies have made from decreased raw-materials prices and increased productivity have not been transferred to other stakeholders.

The distributions are much more similar when ROIC is measured with goodwill included in invested capital. This implies that top-ROIC companies are acquiring other top performers but paying full price for the acquired performance.

ROIC by Industry and Company Size

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 45 years. Exhibit 4.6 shows the median returns on invested capital for a range of industries, and also their upper and lower quartile ROICs. As the exhibit demonstrates, financial performance varies significantly both across and within industries. To illustrate, most apparel retailers earn high returns, but the best performers in the paper packaging industry, which has low median returns, earn higher returns than the weak performers in apparel retail. The data have limitations, because many of the companies are in multiple subindustries, making industry definitions fairly broad. Nevertheless, it is clear that both industry and company are important in explaining individual companies' ROICs. Several companies (e.g., Wal-Mart and Intel) are earning attractive returns in industries where the median return is low, and vice versa.

EXHIBIT 4.6 **ROIC Variations across and within Industries**



Source: Compustat, McKinsey Corporate Performance Center analysis.

Industries where companies build identifiable sustainable advantages, such as patent-protected innovations and brands, tend to generate higher returns. Pharmaceutical and biotechnology companies had a median ROIC of 23.5 percent, whereas companies in commodities and regulated industries, such as airlines and utilities, had much lower ROICs—5.8 percent and 6.3 percent, respectively. Broadcasting and software companies not only have higher median returns, but also greater variation in returns. These industries can benefit from scalability, which explains their higher returns, but compared with pharmaceutical firms, they are less protected by patents, have shorter life cycles for many products, and have lower barriers to entry. This explains their wider distribution of returns.

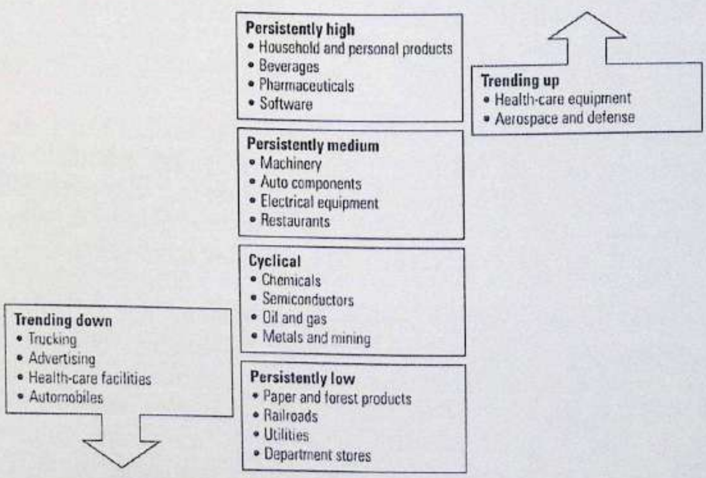
In contrast, department stores have a fairly narrow distribution of returns and a median ROIC of 9 percent. Unsurprisingly, this return is modest compared with industries enjoying more stable brands, patents, and scalable business models, which offer more opportunities for differentiation among individual companies.

The size of a company's revenues shows no clear relation to ROIC, suggesting that scale in terms of absolute size is rarely a source of competitive advantage, as discussed earlier in this chapter. Despite the common perception that economies of scale should continually lower unit costs, many companies reach minimum efficient scale at relatively small sizes. Beyond this point, any incremental growth comes at the same unit cost, or even at slightly higher costs as bureaucratic inefficiency and other inflexibility costs begin to grow. To grasp this point, consider Southwest Airlines, a company that had just 50 percent of the revenues of American Airlines yet three times the equity valuation at year-end 2009.

Sustaining ROIC

Although not shown in Exhibit 4.6, 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 45 years into high, medium, and low groups, we found that most industries stayed in the same group over the period, as shown by Exhibit 4.7.

EXHIBIT 4.7 **Persistence of Industry ROICs**



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

We did find several industries where 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.

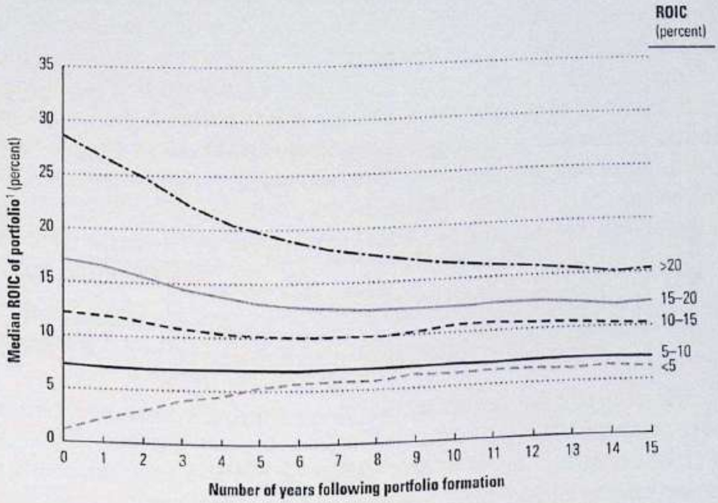
Industries where returns on invested capital clearly are trending up are rare. Two examples are health-care equipment and aerospace and defense. Innovation in health-care equipment has enabled the industry to produce higher-value-added, differentiated products such as stents and artificial joints, as well as more commoditized products, including syringes and forceps. Increased returns on invested capital in aerospace and defense were unexpected. However, on close examination, we found that companies in this sector have been able to reduce their capital intensity as government has effectively provided up-front funding for many more contracts. The sector's higher ROIC simply reflects a lower capital base.

We found 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 4.8 demonstrates a pattern of reverting toward the mean. Companies earning high returns tend to see their ROIC fall gradually over the succeeding 15 years, and companies earning low returns tend 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 shown by Exhibit 4.8 is the persistence of superior performance beyond 10 years. Although the best-performing companies cannot maintain outstanding performance over the long term, their ROIC does *not* revert all the way back to the aggregate median of around 10 percent over 15 years. Instead, the top portfolio's median ROIC drops from 29 percent to 15 percent. High-performing companies are in general

EXHIBIT 4.8 **Nonfinancial Companies: ROIC Decay Analysis**



[1] At year 0, companies are grouped into one of five portfolios, based on ROIC.
Source: Compustat, McKinsey Corporate Performance Center analysis.

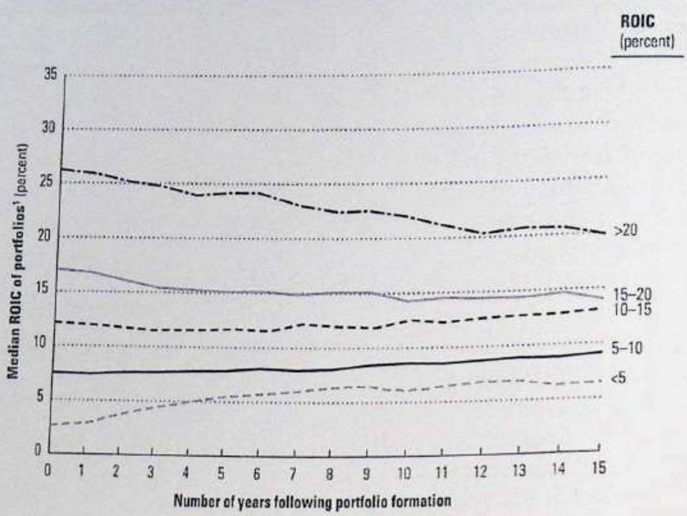
remarkably capable of sustaining a competitive advantage in their businesses and/or finding new business where they continue or rebuild such advantages.

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 WACC is overly conservative for the *typical* company generating high ROICs (continuing value is the focus of Chapter 10).

When benchmarking 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 4.9, we plot the ROIC decay rates for the consumer staples segment of the food and staples industry. As the exhibit demonstrates, these ROICs revert to the mean but at a much slower rate than seen in the full sample. Top performers in consumer staples have a median ROIC of 26 percent at the outset, which drops to 20 percent after 15 years, while top performers in the entire food and staples sample dropped to 15 percent. Even after 15 years, the *original* class of best performers still outperforms the worst performers by more than 13 percentage points.

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 generate higher returns? Conversely, do some top performers become poor

EXHIBIT 4.9 **Consumer Staples: ROIC Decay Analysis**



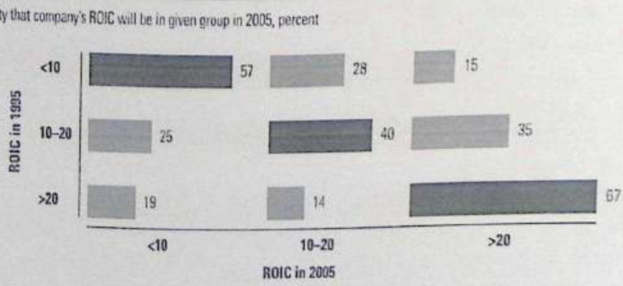
[1] At year 0, companies are grouped into one of five portfolios, based on ROIC.
Source: Compustat, McKinsey Corporate Performance Center analysis.

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 4.10. Transition probabilities read from left to right, and the rows must sum to 100 percent. Thus, for instance, a company whose ROIC was less than 10 percent in 1995 had a 57 percent chance of earning less than 10 percent in 2005.

Both high and low performers demonstrate significant stability in their performance. Companies with high or low ROICs are most likely to stay in the

EXHIBIT 4.10 **ROIC Transition Probability, 1995–2005**

Probability that company's ROIC will be in given group in 2005, percent



Source: Compustat, McKinsey Corporate Performance Center analysis.

same grouping (a 57 percent probability for those with ROIC below 10 percent, and a 67 percent probability for those with ROIC above 20 percent). Even among companies whose ROIC was between 10 and 20 percent, the greatest probability (40 percent) was for remaining in the same grouping 10 years later.

These results show that high-ROIC companies tend to maintain their high returns on invested capital and low-ROIC companies tend to retain their low returns. We have studied earlier time periods as well and found similar results, except that even fewer of the lower-return companies moved up into a higher group. The 1995–2005 period may be unusual in that the median company significantly increased its return on invested capital, as we discussed at the beginning of this section.

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 exclusive determinant of ROIC. Certain industries are biased toward earning 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 importantly, 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.

REVIEW QUESTIONS

1. From a value-creation perspective, is it more important for a company to know *where* to compete or *how* to compete? That is, is it more important to play in the right markets or to be the best player in your current markets?
2. Identify and discuss real examples of companies with a competitive advantage based on customer lock-in as opposed to product innovation. Which do you expect to sustain a high ROIC for a longer time?
3. Why do companies operating within the pharmaceutical and biotechnology industries typically sustain higher ROICs than firms in the technology, hardware, and equipment industries?
4. Why are competitive advantages based on brands, as in the consumer goods industry, often more important for long-term value creation than advantages based on product quality or innovation?

5. Discuss potential explanations for the widening of the distribution of ROICs across all companies over recent decades.
6. Explain the difference between ROICs excluding and ROICs including goodwill for U.S. companies: what does this difference imply and why has it increased so much over the past decade?
7. In Exhibit 4.8, the gradual decline in ROIC of the top-performing companies can be explained by gradual erosion of competitive advantages. What could be the explanation for the gradual increase in ROIC of the bottom-performing companies?
8. Discuss why, within the broader health care sector, ROIC can be declining for health-care facility companies but increasing for health-care equipment companies.

5

Growth

The business world is gripped by growth. The popular view is that a company must grow to survive and prosper, and 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 25 years, most of the 340 companies that have disappeared from the S&P 500 index were acquired by larger companies. That explains why today's public companies are under tremendous pressure to grow.

However, growth creates value only when a company's new customers, projects, or acquisitions generate returns on invested capital (ROICs) greater than the cost of capital, as we discussed in Chapter 2. And finding good, high-value-creating projects becomes increasingly difficult as companies grow larger and their industries ever more competitive. To illustrate, in 1990, a year in which Wal-Mart added 57,000 new employees, the company's revenues grew by 26.3 percent. In 2003, the company grew physically so much bigger that it had to add another 100,000 employees, but its revenue growth that year was only 4.8 percent. To replicate 1990's revenue growth, even at 2003's improved levels of productivity, Wal-Mart would have needed to add nearly half a million people in a single year—a challenge by any standards.

Achieving 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 can improve. Conversely, for companies with a low ROIC, increasing ROIC will create more value than growing will.

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

Just as executives need to understand whether their strategies will lead to high returns on invested capital, as we discussed in the previous chapter, they also need to know which growth opportunities will create the most value. Therefore, 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, and then we analyze the data on corporate growth patterns over the past 45 years.

DRIVERS OF REVENUE GROWTH

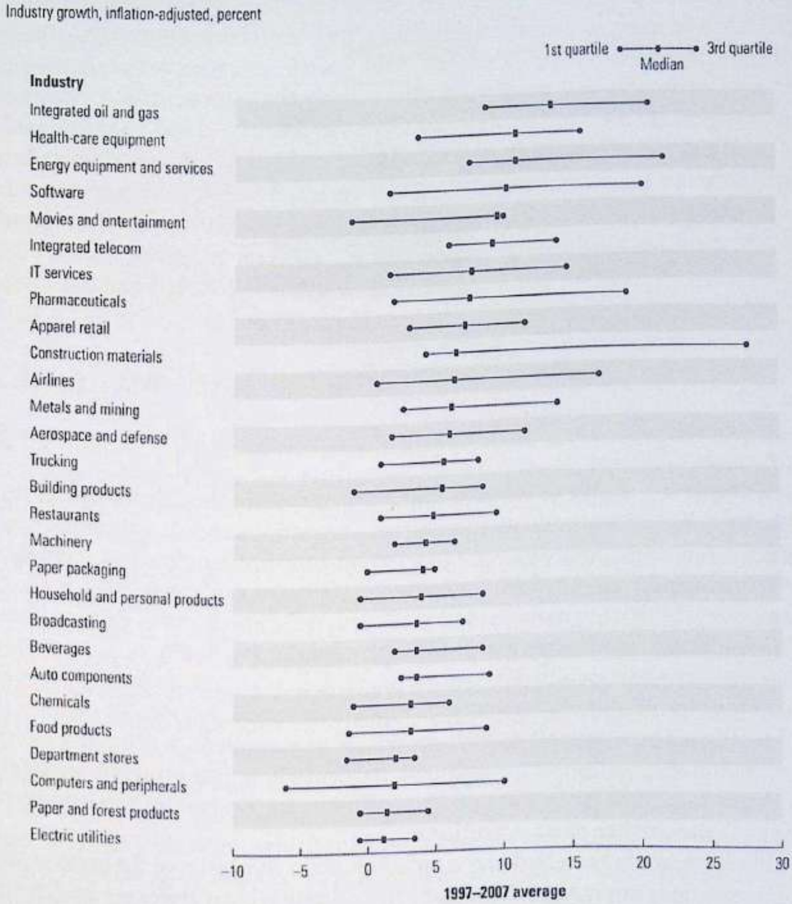
Like ROIC, average industry revenue growth varies considerably across industries, and there are also big differences in growth rates among companies in the same industry. Exhibit 5.1 shows both kinds of variation for the 10 years from 1997 to 2007. In some industries, the most important contributors to the sector's overall revenue growth were price changes and mergers and acquisitions (M&A) activities. For instance, the oil and gas sector benefited from strong oil price increases to realize revenue growth of around 13 percent a year in real terms, the highest median rate for any sector. In volume terms, growth was much lower. The reverse holds for computers and peripherals, which grew at 2 percent per year in real terms. Continual downward pressure on prices for information technology (IT) hardware made the sector one of the slowest growing.

Aside from different price developments, what else explains the large differences in growth apparent among companies in the same industry? Executives need to understand the reasons for variations in growth to assess past growth and plan how to grow in the future. The first step is to disaggregate overall 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 records by gaining or losing share in any particular market. (We define market share as the company's weighted average share of the segments in which it competes.)
3. *Mergers and acquisitions (M&A):* This represents the inorganic growth a company achieves when it buys or sells revenues through acquisitions or divestments.

[2] This section draws on P. Viguerie, S. Smit, and M. Baghai, *The Granularity of Growth* (Hoboken, NJ: John Wiley & Sons, 2008).

EXHIBIT 5.1 **Considerable Variation in Revenue Growth**

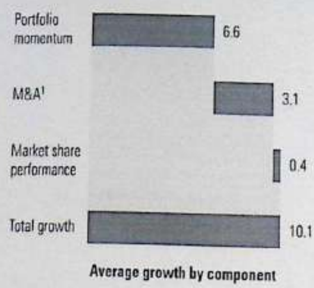


Source: Compustat, McKinsey Corporate Performance Center analysis

Former McKinsey consultant Mehrdad Baghai and our McKinsey colleagues Sven Smit and Patrick Viguerie have analyzed the relative importance of these three components to the growth of more than 416 large companies around the world from 1999 to 2006. The results show that portfolio momentum and M&A explain far more of the differences in the growth of large companies than growth in market share does. As shown in Exhibit 5.2, Baghai, Smit, and Viguerie found that of the 10.1 percent average yearly growth achieved by the sample, 6.6 percentage points came from the growth of the market segments

EXHIBIT 5.2 **Components of Growth**

Compound annual growth rate (CAGR) of revenues for 416 large global companies, 1999–2006, percent



[1] Includes impact of changes in revenue base caused by inorganic activity and share gain/loss

Source: P. Viguerie, S. Smit, and M. Baghai, *The Granularity of Growth* (Hoboken, NJ: Wiley, 2008).

in its portfolio, 3.1 from M&A activity, and a marginal 0.4 from market share performance.[3]

Companies can try to influence the growth rates of their portfolios in several ways. For instance, through selective acquisitions and divestments, companies can change their exposure to growing and shrinking market segments. By introducing new product categories, companies can create new markets themselves. However, managers tend to focus most attention on gaining share in their existing market segments through superior execution, often factoring market share goals into their business plans. Although this is likely to be their least significant source of growth, it remains a necessary one. To capture in full the benefits of overall market growth in any segment, a company needs to maintain its position in the segment, particularly in fast-growing segments that tend to attract innovative or low-cost entrants. Success in this endeavor hangs on the quality of its execution.

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? One explanation is M&A activity, which can add some three percentage points to a company's growth rate. The second and more important reason is that the average growth rate of companies competing in any sector masks big differences in growth across the sector's market segments and subsegments.

To capture this granularity of markets and understand the differences in companies' revenue growth, Baghai, Smit, and Viguerie analyzed market

[3] One might expect the average growth rate from market share gains in the sample to be close to zero. Perhaps more importantly, the entire distribution of growth rates from market share gains lies significantly below those for the other two growth components as well. See, for example, M. Baghai, S. Smit, and P. Viguerie, "The Granularity of Growth," *McKinsey on Finance*, no. 24 (Summer 2007): 25–30.

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 analysis at this level is revealing. The company has three lines of business 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 is much wider. For instance, the business line with the lowest expected growth rate has one of the company's best growth opportunities in one product line, at 24 percent. At the same time, the business with the highest growth rate has several product lines that are shrinking fast and may warrant divestment.

GROWTH AND VALUE CREATION

Achieving the highest revenue growth may depend on choosing the right markets and acquisitions rather than gaining market share. However, the highest growth will not necessarily create the most value, because the three drivers of growth do not all create value in equal measure. To understand why not, consider who loses under alternative revenue growth scenarios 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. Market share 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 21).

Exhibit 5.3 ranks different growth tactics that fall within the three overall growth strategies according to their potential for creating value. This ranking may not be exactly the same for all industries, but it works well as a starting point. The tactics with the highest value-creating potential are all variations on entering fast-growing product markets that take revenues from distant companies, rather than from direct competitors or customers.

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

EXHIBIT 5.3 **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.

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, and also over subsequent products entering the market,[5] neither type of competitor could retaliate, so the innovators created large amounts of value. 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 players' manufacturing and distribution systems can typically produce the additional products at little additional cost.

[5] Products that entered the market at a later stage were less successful because of high switching costs for customers (see Chapter 4).

Clearly, the benefit will not be as large if the company has to increase costs substantially to get 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.

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 rate of growth in the market in question and the way the company goes about gaining market 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, the auto companies aren't likely to create much value from hybrid or electric vehicles.

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 number of 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, half 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. But that is easier said than done.

DIFFICULTY OF SUSTAINING GROWTH

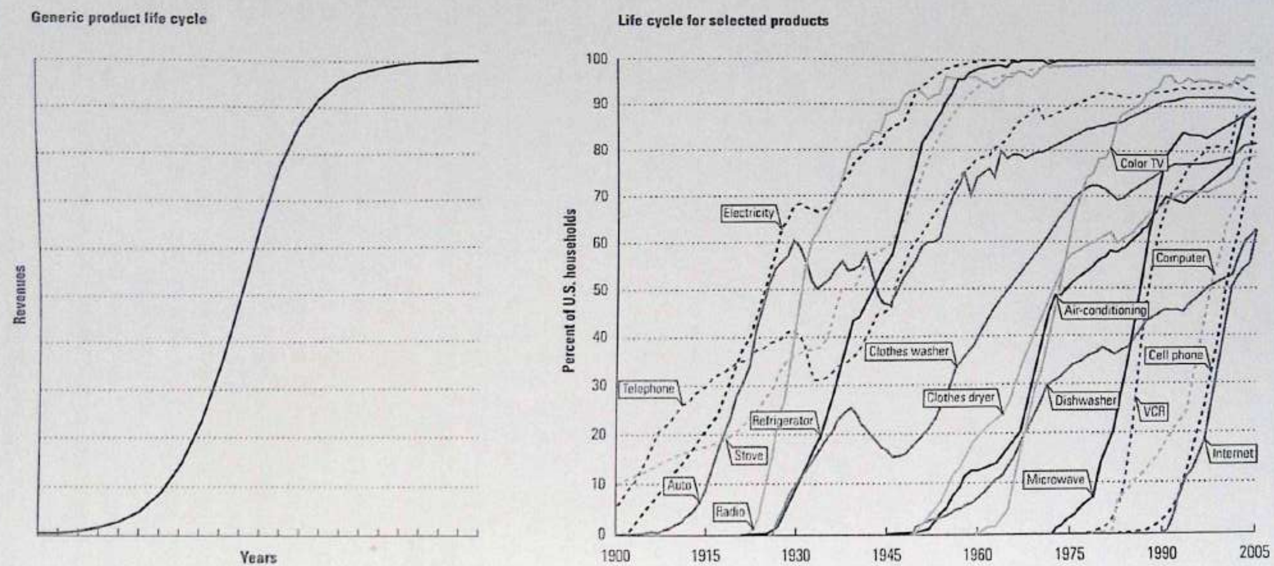
Sustaining high growth is much more difficult than sustaining ROIC, especially for larger companies. The math is simple. Suppose your core product markets are growing at the rate of the gross domestic product (GDP) (say, 5 percent nominal growth) and you currently have $10 billion in revenues. Ten years 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 over $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, some companies' growth targets are unrealistic. We know of one with sales already in excess of $5 billion that has 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,[7] 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—by which we mean 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 5.4. 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

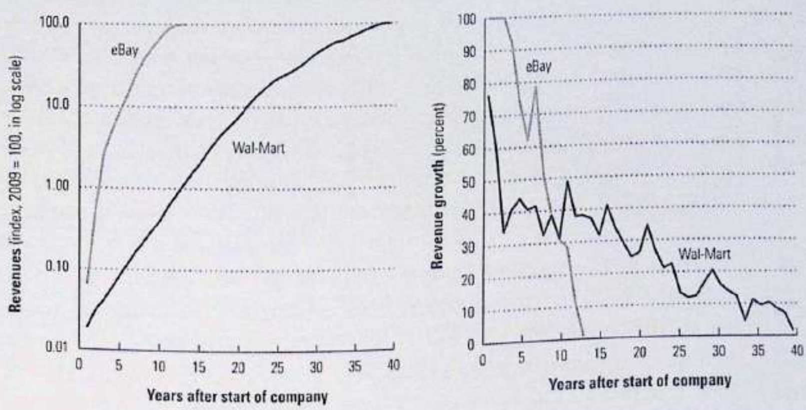
[6] The cutoff point for the Fortune 500 in terms of revenues was around $4 billion in 2009.
[7] World GDP growth was 4 percent a year between 2000 and 2007—the strongest economic growth in decades. See World Bank, "2009 World Development Indicators" (2009).

EXHIBIT 5.4 **Variation in Growth over Product Life Cycle**



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

EXHIBIT 5.5 **Wal-Mart and eBay: Growth Trajectories**



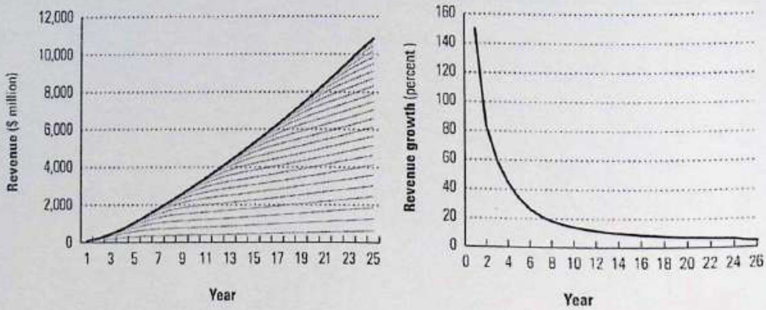
Source: McKinsey Corporate Performance Center analysis.

packaged snacks have continued to grow in line with economic growth for half a century or more, while videocassette recorders lasted less than 20 years before they declined and disappeared.

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 5.5 compares Wal-Mart and eBay. While both have some activities outside their core business, they are largely one-product companies. 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 2008, Wal-Mart generated \$406 billion of revenues, mostly from its core discount and supercenter stores, whereas eBay generated only about \$8.5 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 5.6 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

EXHIBIT 5.6 **The Challenge of Sustaining High Growth**



Source: McKinsey Corporate Performance Center analysis.

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.

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. When the patents for this generation of drugs expire between 2010 and 2015, revenues from them will plummet. Pharmaceutical companies need to launch similar-sized drugs just to make up the difference, let alone keep growing. But 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

In this section, we present our findings on the level and persistence of corporate growth for more than 5,000 U.S.-based nonfinancial companies over the past

45 years. Our analysis of their revenue growth follows the same procedure as our analysis of ROIC data in Chapter 4, except here we use three-year rolling averages to moderate distortions caused by currency fluctuations and M&A activity.[8] 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.) Our overall findings concerning revenue growth are as follows:

- The median rate of revenue growth between 1963 and 2007 was 5.4 percent in real terms. Real revenue growth fluctuates more than ROIC, ranging from 0.9 percent in 1992 to 9.4 percent in 1966.
- High growth rates decay very quickly. Companies growing faster than 20 percent (in real terms) typically grow at only 8 percent within five years and at 5 percent within 10 years.
- Extremely large companies struggle to grow. Excluding the first year, companies entering the Fortune 50 grow at an average of only 1 percent (above inflation) over the following 15 years.

Growth Trends

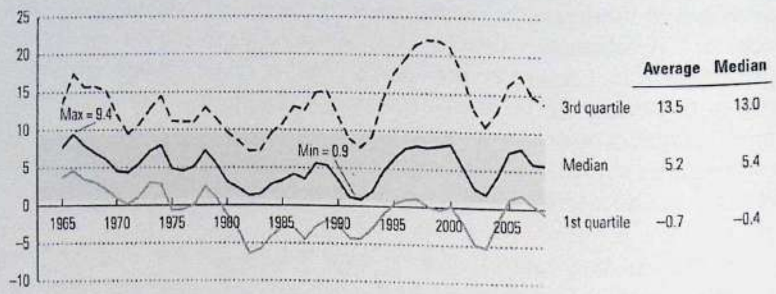
We start by examining aggregate levels and trends of corporate growth. Exhibit 5.7 presents median (real) revenue growth rates between 1963 and 2007. The average median revenue growth rate between 1963 and 2007 equals 5.4 percent per year and oscillates between roughly 1 percent and 9 percent. Median revenue growth demonstrates no trend over time.

A real revenue growth of 5.4 percent is quite high when compared with real GDP growth in the United States (3.2 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 our growth results are likely to be higher. Secondly, as companies become increasingly specialized and outsource more services, firms providing services will grow and develop quickly without affecting the GDP figures. Consider Electronic Data Systems (EDS), a company that provides information technology (IT) and data services. As companies outsource management of their IT to EDS, GDP will not change, since it measures aggregate output. Yet EDS's high growth will influence our sample.

[8] For more detail on how to define and separate organic, M&A, and currency-driven revenue growth, see Chapter 21.

EXHIBIT 5.7 **Long-Term Revenue Growth for Nonfinancial Companies**

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



[1] Compound annual growth rate

Source: Compustat, McKinsey Corporate Performance Center analysis.

A third explanation is global expansion. Many of the companies in our sample create products and generate revenue outside the United States, which again will not affect U.S. GDP. Next comes our 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 5.7 also reveals that from 1973 to 2005, 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.

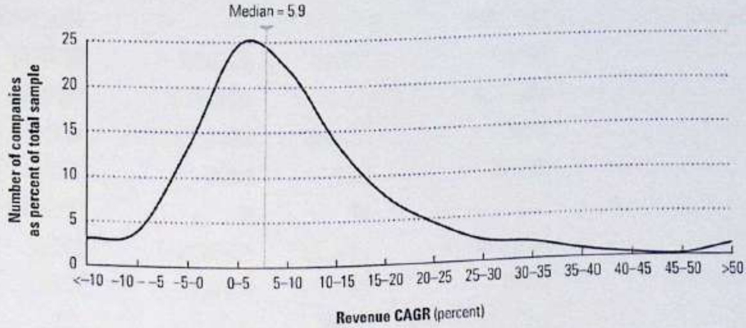
Exhibit 5.8 shows the distribution of real revenue growth from 1997 to 2007. The median revenue growth rate was 5.9 percent, with about one-third of the companies increasing revenues faster than 10 percent. (This includes the effect of acquisitions, so fewer companies grew faster than 10 percent just through organic growth.)

Growth Across Industries

The spread of growth rates across industries varies dramatically, as did the spread of ROICs, described in the previous chapter. Exhibit 5.1 showed that some sectors (including health-care equipment, software, movies and entertainment, and integrated telecom) had annual growth rates in excess of

EXHIBIT 5.8 **Distribution of Growth Rates**

Inflation-adjusted 1997–2007 revenue growth rate[1] distribution, percent



[1] Compound annual growth rate.

Source: Compustat, McKinsey Corporate Performance Center analysis.

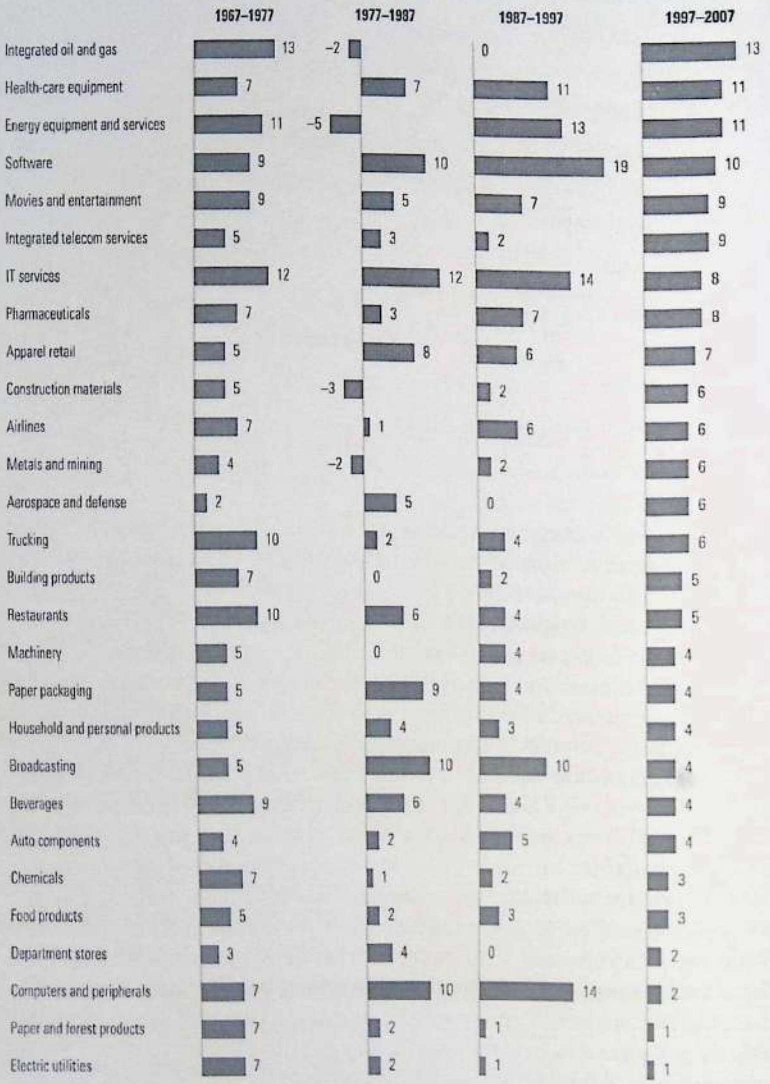
9 percent, vastly outgrowing others (food products, department stores, paper and forest products, and electric utilities) with growth rates of 3 percent or less.

Yet, unlike the ranking of industries by ROIC, the ranking of industries by growth varies significantly over time, as shown in Exhibit 5.9. Some of the variation is explained by structural factors, such as changes in customer demand or competition from substitute products. Industries that were among the fastest growing between 1967 and 1977, with growth of 9 percent or more (for example, restaurants and beverages), dropped to mediocre growth levels as their markets matured over recent decades. Broadcasting had very strong growth between 1977 and 1997, but its growth dropped over the past 10 years to just 4 percent (its growth rate in the 1960s) as substitute Internet-based services became available. In other cases, the variation in growth derives from the business cycle, which affects some industries more than others. For example, the cycle-sensitive sectors of construction materials, trucking, airlines, and building products move up and down in the growth rankings much more than health-care equipment and household and personal products, for which demand is more stable. And the commodities price boom of the past decade has driven growth rates in integrated oil and gas, energy equipment and services, and metals and mining to their highest levels of the past 45 years.

In spite of this high degree of variation, some sectors have consistently been among the fastest growing. These include software, IT services, and health-care equipment, where demand has remained strong for four decades. Others, such as auto components, food products, and department stores, have consistently had among the lowest growth rates, as their markets had already reached maturity in the 1970s, the first decade shown in Exhibit 5.9.

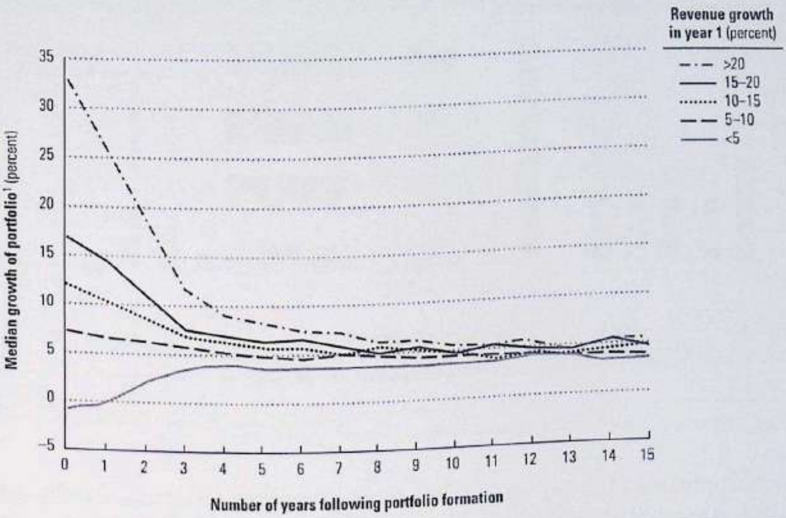
EXHIBIT 5.9 **Unstable Growth for Industries**

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



Source: Compustat, McKinsey Corporate Performance Center analysis

EXHIBIT 5.10 **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 Center analysis.

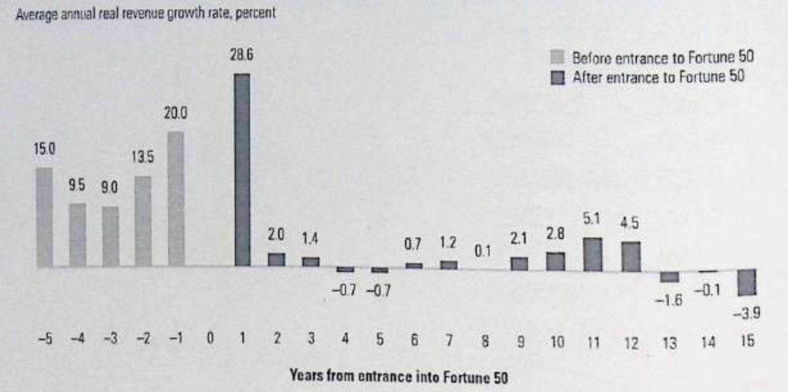
Sustaining Growth

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 10 percentage points or more.[9]

To put long-term corporate growth rates in their proper perspective, we present historical rates of growth decay over the past 45 years. Companies were segmented into five portfolios, depending on their growth rate in the year the portfolio was formed. Exhibit 5.10 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 reduces considerably, and by year 5, the highest-growth portfolio outperforms the lowest-growth portfolio by less than 5 percentage points. Within 10 years, this difference drops to less than 2 percentage points. Comparing the decay of growth with that of ROIC shown

[9] See, for example, M. Goedhart, B. Russell, and Z. Williams, "Prophets and Profits," *McKinsey on Finance*, no. 2 (Autumn 2001): 11–14.

EXHIBIT 5.11 **Dramatic Fall in Revenue Growth Rate for Companies Reaching Fortune 50**



Source: Corporate Executive Board, "Stall Points: Barriers to Growth for the Large Corporate Enterprise" (1998).

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.

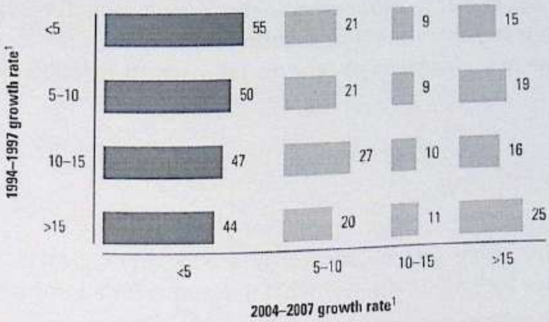
As we discussed earlier in this chapter, companies struggle to maintain high growth because product life cycles are finite and growth gets more difficult as companies get bigger. Exhibit 5.11 summarizes results compiled by the Corporate Executive Board to show what happens to real revenue growth when companies enter the Fortune 50.[10] Although they show strong growth before entering the Fortune 50 (often because of acquisitions), their growth drops dramatically afterward. In the five years before entering, real revenue growth varies between 9 percent and 20 percent. And although average growth is high in the year immediately following entry (28.6 percent), in every subsequent year, growth is a lot lower. In fact, in five of the 15 years after entry, the new entrants shrink in real terms.

Do any companies counter this norm? The short answer is no. Exhibit 5.12 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 1994 to 1997, 55 percent 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 1994 to 1997, 44 percent grew at real rates below 5 percent 10 years later. Only 25 percent of

[10] Corporate Executive Board, "Stall Points: Barriers to Growth for the Large Corporate Enterprise" (1998).

EXHIBIT 5.12 **Revenue Growth Transition Probability**

Probability that company's growth rate[1] will be in given group from 2004 to 2007, percent



[1] Compound annual growth rate.

Source: Compustat, McKinsey Corporate Performance Center analysis.

high-growth companies maintained better than 15 percent real growth 10 years later, most of which was probably driven by 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 almost exclusively driven by the growth of the markets they operate in and by the acquisitions they undertake (and the markets the acquired companies operate in). 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 just about 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.

REVIEW QUESTIONS

1. Discuss the three generic sources of a company's growth, their relative importance for its growth, and what this means for a company's strategy.
2. For which type of company is additional growth likely to create more value: a high-ROIC company in a mature market or a low-ROIC company in a fast-growing market? Give reasons for your answer.
3. Why could growth through a series of bolt-on acquisitions create more value than growth through a single large acquisition? (Consider premium paid and synergies created for each individual transaction.)
4. Identify and discuss an example where growth in market share through a price war created long-term value for a company.
5. Why do fast-growing companies typically fail to sustain their high growth rates?
6. Why do company growth rates typically converge much more quickly toward the average rate across all companies than their rates of ROIC, given that both ultimately depend on the underlying product life cycles?
7. Discuss why the ranking of industries by growth varies more over time than their ranking by ROIC.
8. If growth from gaining market share through product promotion and pricing rarely creates much value, why do most consumer goods companies put so much effort into it?

Part Two

Core Valuation Techniques

6

Frameworks for Valuation

In Part One, we built a conceptual framework to show what drives value. In broad terms, a company's value is driven by its ability to earn a healthy return on invested capital (ROIC) and by its ability to grow. Healthy rates of return and growth result in 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 6.1 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 is gaining in popularity because of its close link to economic theory and competitive strategy. Economic profit highlights whether a company is earning its cost of capital and how its financial performance is expected to change over time. 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 income 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 specifically forecasts and values any cash flows associated with capital structure separately, rather than embedding their value in the cost of capital.

The chapter also includes a discussion of capital cash flow and equity cash flow valuation models. Because these two valuation models mix together

EXHIBIT 6.1 **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.

operating performance and capital structure in cash flow, they lead more easily to mistakes. 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 36).

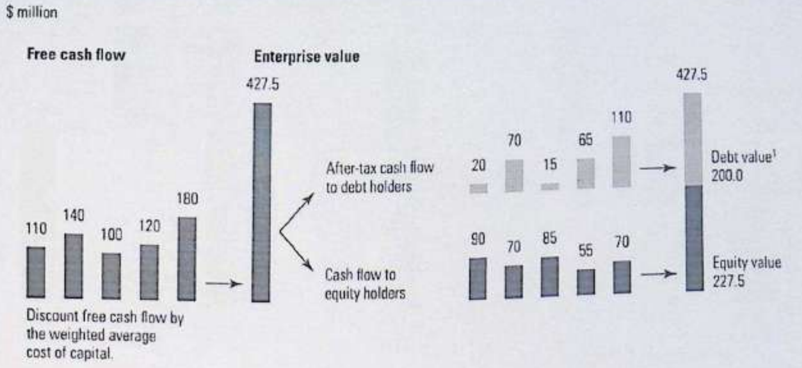
ENTERPRISE DISCOUNTED CASH FLOW MODEL

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 for all investor capital. The claims on cash flow of debt holders and other nonequity investors are subtracted from enterprise value to determine equity holders' value.[1] Equity valuation models, in contrast, value only the equity holders' claims against operating cash flows. Exhibit 6.2 demonstrates the relationship between enterprise value and equity value. For this company, equity holders' value can be calculated either directly at $227.5 million or by estimating enterprise value ($427.5 million) and subtracting debt ($200.0 million).

Although both methods lead to identical results when applied correctly, the equity method is difficult to apply, since matching equity cash flows with the correct cost of equity is particularly challenging (for more on this, see the section

[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 6.2 **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.

on equity valuation later in this chapter). Consequently, to value a company's equity, we recommend valuing the *enterprise* first and then subtracting the value of any nonequity financial claims.

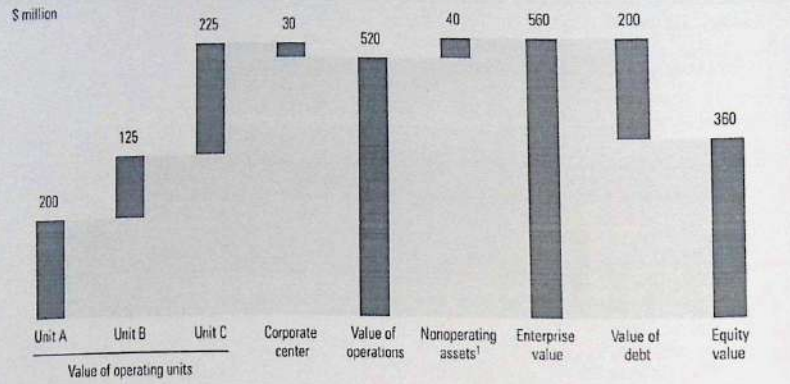
The enterprise method is especially useful when applied to a multibusiness company. As shown in Exhibit 6.3, the enterprise value equals the summed value of the individual operating units less the present value of the corporate-center costs, plus the value of nonoperating assets.[2] If you use enterprise discounted cash flow instead of the equity cash flow model, you can value individual projects, business units, and even the entire company with a consistent methodology.

Valuing a company's common 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 marketable securities, nonconsolidated subsidiaries, and other equity investments. Summing the value of operations and nonoperating assets gives enterprise value.
3. Identify and value all debt and other nonequity claims against the enterprise value. Debt and other nonequity claims include (among others)

[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 two definitions are equivalent for companies without nonoperating assets (e.g., excess cash and nonconsolidated subsidiaries) and debt equivalents (e.g., unfunded pension liabilities).

EXHIBIT 6.3 **Enterprise Valuation of a Multibusiness Company**



[1] Including excess cash and marketable securities.

fixed-rate and floating-rate debt, unfunded pension liabilities, employee options, and preferred stock.

4. Subtract the value of nonequity financial claims from enterprise value to determine the value of common equity. To estimate price per share, divide equity value by the number of current shares outstanding.

Exhibit 6.4 presents the results of an enterprise DCF valuation for Home Depot, the world's largest retailer of home improvement products. We use Home Depot throughout the chapter to compare valuation methods. To value Home Depot, discount each annual projected 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 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, and not as a lump sum, discounting in full-year increments understates the appropriate discount factor. Therefore, adjust the present value upward by half a year;[4] the resulting value of operations is $65.3 billion.

To this value, add nonoperating assets (e.g., excess cash and other nonoperating assets) to estimate enterprise value. For Home Depot, enterprise value ($65.8 billion) almost mirrors the value of operations ($65.3 billion) because its

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

[4] A half-year adjustment is made to the present value for Home Depot 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.

EXHIBIT 6.4 **Home Depot: Enterprise DCF Valuation**

Forecast year	Free cash flow ($ million)	Discount factor (@ 8.5%)	Present value of FCF ($ million)
2009	5,909	0.922	5,448
2010	2,368	0.850	2,013
2011	1,921	0.784	1,506
2012	2,261	0.723	1,634
2013	2,854	0.666	1,902
2014	3,074	0.614	1,889
2015	3,308	0.567	1,874
2016	3,544	0.522	1,852
2017	3,783	0.482	1,822
2018	4,022	0.444	1,787
Continuing value	92,239	0.444	40,966
Present value of cash flow			62,694
Midyear adjustment factor			1.041
Value of operations			65,291
Value of excess cash			–
Value of long-term investments			361
Value of tax loss carry-forwards			112
Enterprise value			65,764
Less: Value of debt			(11,434)
Less: Value of capitalized operating leases			(8,298)
Equity value			46,032
Number of shares outstanding (December 2008)			1.7
Equity value per share			27.1

nonoperating assets are negligible. From enterprise value, subtract the present value of debt and other nonequity claims. Departing from its historically conservative capital structure, the company issued a considerable amount of debt ($11.4 billion) following the acquisition of Hughes Supply in 2006. Similar to most retailers, Home Depot uses off-balance-sheet operating leases ($8.3 billion) to finance its stores. Dividing the resulting equity value by the number of shares outstanding (1.7 billion) leads to an estimate of per-share value of $27.10. During the first half of 2009, Home Depot's stock price traded in the mid-$20s.

Over the next few pages, we outline the enterprise DCF valuation process. Although we present it sequentially, valuation is an iterative process. To value operations, we reorganize the company's financial statements to separate operating items from nonoperating items and capital structure; we then analyze the company's historical performance; define and project free cash flow over the short, medium, and long 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, and as such is the company's opportunity cost of funds.

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

Exhibit 6.5 presents the historical NOPLAT and invested capital for Home Depot and one of its direct competitors, Lowe's. To calculate ROIC, divide NOPLAT by average invested capital. In 2008, Home Depot's return on invested capital equaled 8.0 percent (based on a two-year average of invested capital), which almost matches its 2008 weighted average cost of capital of 8.3 percent.

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 accountant's cash flow from operations (provided in the company's annual report), free cash flow is independent of nonoperating items and capital structure.

Exhibit 6.6 presents historical free cash flow for both Home Depot and Lowe's. As seen in the exhibit, Home Depot generated $3.7 billion in free cash flow in 2008, whereas the free cash flow of Lowe's is considerably smaller. This isn't necessarily a problem for Lowe's. Its free cash flow is small because the company is reinvesting most of its gross cash flow to grow its business.

Analyzing historical performance Once the company's financial statements are reorganized, analyze the company's historical financial performance. By

EXHIBIT 6.5 **Home Depot and Lowe's: Historical ROIC Analysis**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Net sales	90,837	77,349	71,288	46,927	48,283	48,230
Cost of merchandise sold	(61,054)	(51,352)	(47,298)	(30,729)	(31,556)	(31,729)
Selling, general, and administrative	(18,348)	(17,053)	(17,846)	(9,884)	(10,656)	(11,176)
Depreciation	(1,645)	(1,693)	(1,785)	(1,162)	(1,366)	(1,539)
Add: Operating lease interest	441	536	486	185	169	199
Adjusted EBITA	10,231	7,787	4,845	5,337	4,874	3,985
Operating cash taxes	(3,986)	(3,331)	(1,811)	(2,071)	(1,973)	(1,496)
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489
Invested capital						
Operating working capital	4,556	3,490	3,490	1,725	1,792	2,084
Net property and equipment	26,605	27,476	26,234	18,971	21,361	22,722
Capitalized operating leases	9,141	7,878	8,298	3,034	3,528	3,913
Other operating assets, net of operating liabilities	(1,027)	(1,635)	(2,129)	(126)	(461)	(450)
Invested capital (excluding goodwill)[1]	39,275	37,209	35,893	23,604	26,220	28,269
Goodwill and acquired intangibles	7,092	1,309	1,134	–	–	–
Cumulative amortization and unreported goodwill	177	49	49	730	730	730
Invested capital (including goodwill)[1]	46,543	38,567	37,075	24,334	26,950	29,000
Return on invested capital (percent)						
ROIC excluding goodwill (average)[1]	16.7	11.7	8.3	14.5	11.6	9.1
ROIC including goodwill (average)[1]	14.5	10.5	8.0	14.0	11.3	8.9

[1] Goodwill includes goodwill, acquired intangibles, cumulative amortization, and unreported goodwill.

thoroughly analyzing the past, we can document whether the company has created value, whether it has grown, and how it compares with its competitors. A good analysis needs to 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 6.7 presents a 10-year summary of Home Depot's pretax operating margin, a critical component of return on invested capital. Before Robert Nardelli was hired as CEO in 2002, the company spent roughly 70 percent of revenue on merchandise and 19 percent on selling expenses, leading to an operating profit near 10 percent. During his tenure, Nardelli focused the organization on reducing the cost of merchandise. This led to a 2 percent increase in operating margin. In 2007, Frank Blake replaced Nardelli as CEO and stated he would make improved customer service a core part of the future strategy.[5] As a result, profitability dropped as selling expenses increased from 20 percent

[5] "Home Depot to Scale Back Growth: Back-to-Basics Plan Projected to Cut Earnings," *Atlanta Journal Constitution*, March 1, 2007.

EXHIBIT 6.6 **Home Depot and Lowe's: Historical Free Cash Flow**

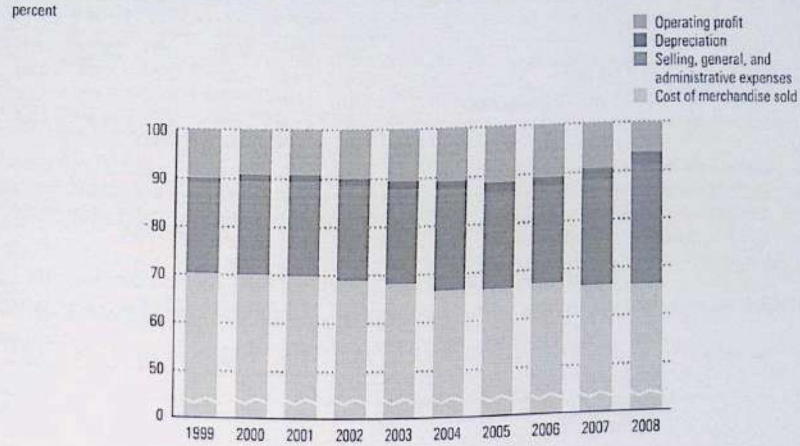
$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489
Depreciation	1,645	1,693	1,785	1,162	1,366	1,539
Gross cash flow	7,890	6,149	4,818	4,428	4,267	4,028
Change in operating working capital	(936)	(739)	–	168	(67)	(292)
Net capital expenditures	(3,349)	(3,577)	(543)	(3,779)	(3,756)	(2,900)
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	291	(494)	(385)
Investments in goodwill and acquired intangibles	(3,525)	–	175	–	–	–
Decrease (increase) in net other operating assets	224	457	494	52	335	(11)
Increase (decrease) in accumulated other comprehensive income	(99)	445	(832)	–	7	(14)
Gross investment	(8,899)	(2,152)	(1,125)	(3,268)	(3,975)	(3,602)
Free cash flow	(1,009)	3,998	3,693	1,160	292	426
After-tax nonoperating income	(6)	334	(72)	52	42	44
Decrease (increase) in nonoperating assets	2	8,384	283	134	(376)	311
Cash flow available to investors	(1,013)	12,716	3,904	1,346	(42)	781
Reconciliation of cash flow to investors						
After-tax interest expense	244	432	390	127	148	199
After-tax operating lease interest expense	274	333	303	114	105	124
Decrease (increase) in debt	(7,576)	(1,769)	1,996	(905)	(2,244)	620
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	291	(494)	(385)
Flows to debt holders	(8,272)	258	2,269	(373)	(2,485)	557
Decrease (increase) in nonoperating deferred taxes	(282)	302	270	–	–	–
Dividends	1,395	1,709	1,521	276	428	491
Repurchased and retired shares	5,889	10,336	(190)	1,400	2,007	(267)
Adjustments to retained earnings	257	111	34	43	8	–
Flows to equity holders	7,259	12,458	1,635	1,719	2,443	224
Cash flow available to investors	(1,013)	12,716	3,904	1,346	(42)	781

to 24 percent of revenue. A reliable estimate of future sales expenses is critical for an accurate assessment of enterprise value based on future cash flow.

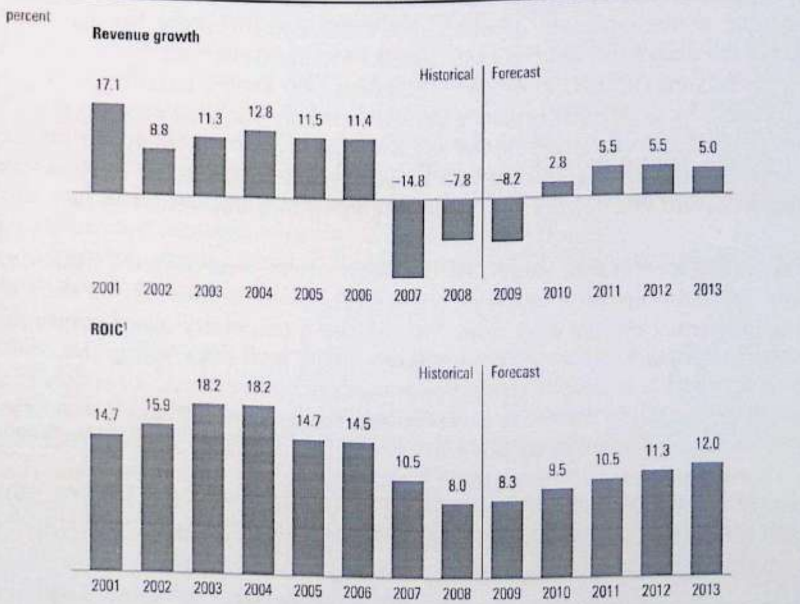
Projecting revenue growth, ROIC, and free cash flow The next task in building an enterprise DCF valuation is to project revenue growth, return on invested capital, and free cash flow. Exhibit 6.8 graphs historical ROIC, projected ROIC, and revenue growth for Home Depot. As the graphs demonstrate, the company's revenue growth and ROIC fell dramatically with the collapse of the U.S. housing market. Sell-side research analysts forecast a gradual recovery by 2011 but do not project growth and return on invested capital to return to their historical levels, given the maturity of the market.

EXHIBIT 6.7 **Home Depot: Operating Margin Analysis**



Note: SG&A and operating profit adjusted for operating leases.

EXHIBIT 6.8 **Home Depot: Projected Revenue Growth and ROIC**



[1] ROIC measured using two-year average invested capital with goodwill and acquired intangible assets.

EXHIBIT 6.9 **Home Depot: Projected Free Cash Flow**

$ million

	Historical			Forecast		
	2006	2007	2008	2009	2010	2011
NOPLAT	6,245	4,456	3,033	2,971	3,269	3,780
Depreciation	1,645	1,693	1,785	1,639	1,685	1,778
Gross cash flow	7,890	6,149	4,818	4,610	4,954	5,558
Change in operating working capital	(936)	(739)	–	292	(73)	(163)
Net capital expenditures	(3,349)	(3,577)	(543)	503	(2,355)	(3,151)
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	678	(212)	(434)
Investments in goodwill and acquired intangibles	(3,525)	–	175	–	–	–
Decrease (increase) in net other operating assets	224	457	494	(174)	54	111
Increase (decrease) in accumulated other comprehensive income	(99)	445	(832)	–	–	–
Gross investment	(8,899)	(2,152)	(1,125)	1,299	(2,586)	(3,637)
Free cash flow	(1,009)	3,998	3,693	5,909	2,368	1,921

Free cash flow, which is driven by revenue growth and ROIC, provides the basis for an enterprise DCF valuation. Exhibit 6.9 shows a summarized free cash flow calculation for Home Depot.[6] To forecast Home Depot's free cash flow, start with forecasts of NOPLAT and invested capital. 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 9 for detail on how to forecast cash flows). Moving further out, individual line items become difficult to project. Therefore, over the medium horizon (5 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, though, projecting even key drivers on a year-by-year basis becomes meaningless. To value cash flows beyond this point, use a continuing-value formula, described next.

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:

$$\text{Value of Operations} = \frac{\text{Present Value of Free Cash Flow}}{\textit{during}\text{ Explicit Forecast Period}} + \frac{\text{Present Value of Free Cash Flow}}{\textit{after}\text{ Explicit Forecast Period}}$$

Although many continuing-value models exist, we prefer the key value driver model presented in Chapter 2. The key value driver formula is superior

[6] 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 6.10 **Home Depot: Continuing Value**

$ million

Key inputs[1]	
Projected NOPLAT in 2019	6,122
NOPLAT growth rate in perpetuity (g)	4.0%
Return on new invested capital (RONIC)	12.2%
Weighted average cost of capital (WACC)	8.5%

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

$$= 91{,}440$$

[1] Enterprise valuation based on $92,239 million, the precise calculation without rounding.

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:

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

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 capital (RONIC), the weighted average cost of capital (WACC), and long-run growth in NOPLAT (g).

Exhibit 6.10 presents an estimate for Home Depot's continuing value. Based on a final-year estimate of NOPLAT ($6.1 billion), return on new investment (12.2 percent) slightly above the cost of capital (8.5 percent), and a long-term growth rate of 4 percent, the continuing value is estimated at $92.2 billion. This value is then discounted into today's dollars and added to the value from the explicit forecast period to determine Home Depot's operating value. (Exhibit 6.4 discounts continuing value in 2018 back to 2009.)

Alternative methods and additional details for estimating continuing value are provided in Chapter 10.

Discounting free cash flow at the weighted average cost of capital To determine the value of operations, discount each year's forecast of free cash flow for time and risk. When you discount 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 interest tax shield (ITS) has been excluded from free cash flow. Since the interest tax shield 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, we can compare operating performance across companies and over time without regard to capital structure. By focusing solely on operations, we can 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 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 Home Depot is presented in Exhibit 6.11. Home Depot funds operations with a mix of debt and equity. Compared with earlier years, the company is using a substantial amount of debt to fund operations, making its net debt-to-value 31.5 percent. The higher debt-to-value is a result of the company's use of debt to fund acquisitions, use of excess cash to repurchase shares, and a drop in equity value resulting from the collapse of the U.S. housing market. The increase in leverage has led to a drop in the company's debt rating and an increase in equity risk. Even so, Home Depot's weighted average cost of capital remains quite low (8.5 percent), as interest rates are at historical lows.

This cost of capital is used to discount each year's forecasted cash flow, as well as the continuing value. The result is the value of operations.

EXHIBIT 6.11 **Home Depot: Weighted Average Cost of Capital**

percent

Source of capital	Proportion of total capital	Cost of capital	Marginal tax rate	After-tax cost of capital	Contribution to weighted average[1]
Debt	31.5	6.8	37.6	4.2	1.3
Equity	68.5	10.4		10.4	7.1
WACC	100.0				8.5

[1] Total does not sum due to rounding error.

Identifying and Valuing Nonoperating Assets

Many companies own assets that have value but whose cash flows 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.[7] 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. The quality of this analysis, however, will depend on how much the other company discloses: typically, the workings of nonconsolidated subsidiaries are not clearly visible to the company's shareholders.

Other nonoperating assets include excess cash, tradable securities, and customer financing arms. A detailed process for identifying and valuing nonoperating assets can be found in Chapter 12.

Identifying and Valuing Nonequity Claims

To convert enterprise value into equity value, subtract any nonequity claims, such as short-term debt, long-term debt, 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.

In today's increasingly complex financial markets, nonequity claims are not always easy to spot. For example, throughout the first decade of the 2000s, numerous banks moved assets and the debt that financed them off the balance sheet into special investment vehicles (SIVs). Since SIVs are structured as separate legal entities, the originating banks are not contractually responsible for the debt. Yet to regain trust with bank clients who lent the SIV money, many banks decided to repurchase the assets and guarantee the corresponding debt. In November 2008, Citigroup repurchased $17 billion in SIV-owned assets. Its share price dropped 23 percent on the day of the announcement.[8]

[7] For minority 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.

[8] "Citi's Slide Deepens as Investors Bail Out: Shares Drop 23% as SIV Move, Analyst's Warning Spook Market; Pandit Points to Strengths," *Wall Street Journal*, November 20, 2008.

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 11 for more details.)
- *Operating leases:* These represent the most common form of off-balance-sheet debt. 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:* During the early 2000s, accounting bodies around the globe began requiring companies to report on the balance sheet the present value of unfunded retirement liabilities. If these liabilities are not explicitly visible (line items are often consolidated), check the company's note on pensions to determine the size of any unfunded liabilities and where they are reported on the balance sheet.
- *Preferred stock:* Although the name denotes equity, preferred stock in well-established companies more closely resembles unsecured debt.
- *Employee options:* Each year, many companies offer their employees compensation in the form of options. Since options give the employee the right to buy company stock at a potentially discounted price, they can have great value.
- *Minority interest:* When a company controls a subsidiary but does not own 100 percent, the investment must be consolidated on the parent company's balance sheet. The funding other investors provide is recognized on the parent company's balance sheet as minority interest. When valuing minority interest, it is important to realize 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 financial claims are covered in detail in Chapter 12. A detailed discussion of how to analyze operating leases, unfunded pension liabilities, and employee options is presented in Chapter 27.

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 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. Home Depot has traditional debt ($11.4 billion) and capitalized operating leases ($8.3 billion). To value Home Depot's common equity, subtract each of these claims from Home Depot's enterprise value (see Exhibit 6.4).

To determine Home Depot's share price, divide the estimated common-stock value by the number of *undiluted* shares outstanding. Do not use diluted shares. We have already valued convertible debt and employee stock options separately. If we were to use diluted shares, we would be double-counting the options' value.

At the end of fiscal year 2008, Home Depot had 1.7 billion shares outstanding. Dividing the equity estimate of $46.0 billion by 1.7 billion shares generates an estimated value of $27 per share. The estimated share value assumes Home Depot can rebound from the 2008 recession, with returns slightly above its cost of capital and growth back in line with gross domestic product (GDP). During the first half of 2009, Home Depot's actual stock price traded between $20 and $25 per share.

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 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:

$$\text{Economic Profit} = \text{NOPLAT} - (\text{Invested Capital} \times \text{WACC})$$

In Exhibit 6.12, we present economic-profit calculations for Home Depot using both methods. Historically, Home Depot earned significant economic profits. But as the housing boom waned in 2007, ROIC fell below the company's cost of capital, and as a result economic profit became negative. Research

EXHIBIT 6.12 **Home Depot: Economic Profit Summary**

$ million

	Historical			Forecast		
	2006	2007	2008	2009	2010	2011
Method 1:						
Return on invested capital (percent)[1]	15.9	9.6	7.9	8.0	9.6	10.8
Weighted average cost of capital (percent)	8.4	8.2	8.3	8.5	8.5	8.5
Economic spread (percent)	7.5	1.4	–0.4	–0.4	1.1	2.3
× Invested capital (beginning of year)	39,389	46,543	38,567	37,075	34,137	35,038
= Economic profit (loss)	2,950	629	(162)	(164)	383	818
Method 2:						
Invested capital (beginning of year)	39,389	46,543	38,567	37,075	34,137	35,038
× Weighted average cost of capital (percent)	8.4	8.2	8.3	8.5	8.5	8.5
Capital charge	3,295	3,827	3,195	3,135	2,886	2,962
NOPLAT	6,245	4,456	3,033	2,971	3,269	3,780
Capital charge	(3,295)	(3,827)	(3,195)	(3,135)	(2,886)	(2,962)
Economic profit (loss)	2,950	629	(162)	(164)	383	818

[1] ROIC measured using beginning of year capital.

analysts expected economic profit to become positive again in 2009, but nowhere near its level before the housing boom.

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 (see Appendix A) and the assumption that the company's ROIC on new projects equals historical ROIC, we can 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:

$$\text{Value}_0 = \text{Invested Capital}_0 + \sum_{t=1}^{\infty} \frac{\text{Invested Capital}_{t-1} \times (\text{ROIC}_t - \text{WACC})}{(1 + \text{WACC})^t}$$

Since the economic-profit valuation was derived directly from the free cash flow model (see Appendix B for a general proof of equivalence), any valuation based on discounted economic profits will be identical to enterprise DCF. To assure equivalence, however, you must use the following values:

- Beginning-of-year invested capital (i.e., last year's value).
- The same invested-capital number for both economic profit and ROIC. 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.
- A constant cost of capital to discount projections.

Exhibit 6.13 presents the valuation results for Home Depot using economic profit. Economic profits are explicitly forecast for 10 years; the remaining years are valued using an economic-profit continuing-value formula.[9] Comparing the equity value from Exhibit 6.4 with that of Exhibit 6.13, we see that the estimate of Home Depot's intrinsic value is the same, regardless of the method.

[9] 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 6.13 **Home Depot: Economic Profit Valuation**

Year	Invested capital[1] ($ million)	ROIC[1] (percent)	WACC (percent)	Economic profit ($ million)	Discount factor (@ 8.5%)	Present value of economic profit ($ million)
2009	37,075	8.0	8.5	(164)	0.922	(151)
2010	34,137	9.6	8.5	383	0.850	325
2011	35,038	10.8	8.5	818	0.784	641
2012	36,897	11.6	8.5	1,145	0.723	827
2013	38,900	12.3	8.5	1,487	0.666	991
2014	40,821	12.3	8.5	1,550	0.614	952
2015	42,748	12.2	8.5	1,611	0.567	913
2016	44,665	12.2	8.5	1,671	0.522	873
2017	46,568	12.2	8.5	1,731	0.482	834
2018	48,453	12.1	8.5	1,789	0.444	795
Continuing value				41,922	0.444	18,619
Present value of economic profit						25,619
Invested capital in 2008						37,075
Invested capital plus present value of economic profit						62,694
Midyear adjustment factor						1.041
Value of operations						65,291
Value of excess cash						–
Value of long-term investments						361
Value of tax loss carry-forwards						112
Enterprise value						65,764
Value of debt						(11,434)
Less: Value of capitalized operating leases						(8,298)
Equity value						46,032

[1] Invested capital is measured at the beginning of the year.

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 6.13. The current valuation is contingent on a small and gradual improvement in ROIC from 8.0 percent to 12.1 percent, conservative by most measures. This stands in stark contrast to our assessment in 2004, when the market valuation was dependent on maintaining high returns on capital:

> The valuation depends on Home Depot's ability to maintain current levels of ROIC (17.5 percent) well above the WACC (9.3 percent). If the company's markets become saturated, growth could become elusive, and some companies might compete on price to steal market share. If this occurs, ROICs will drop, and economic profits will revert to zero.[10]

[10] Tim Koller, Marc Goedhart, and David Wessels, *Valuation: Measuring and Managing the Value of Companies*, 4th ed. (Hoboken, NJ: John Wiley & Sons, 2005), 119.

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 could continue to grow, even as ROIC falls.

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 adjusted present value 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:[11]

$$\begin{matrix}\text{Adjusted}\\\text{Present Value}\end{matrix} = \begin{matrix}\text{Enterprise Value as if the}\\\text{Company Was All-Equity Financed}\end{matrix} + \begin{matrix}\text{Present Value of}\\\text{Tax Shields}\end{matrix}$$

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

[11] In this book, we focus 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.

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.

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 bankruptcy and walk away, restricting 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-based 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).[12] To this value, add any value created by the company's use of debt. Exhibit 6.14 values Home Depot using adjusted present value. Since we assume (for expositional purposes) that Home Depot will manage its capital structure to a target debt-to-value level of 35 percent, the APV-based valuation leads to the same value for equity as did enterprise DCF (see Exhibit 6.4) and economic profit (see Exhibit 6.13). A simplified proof of equivalence between enterprise DCF and adjusted present value can be found in Appendix C. The following subsections explain APV in detail.

Valuing Free Cash Flow at Unlevered Cost of Equity

When valuing a company using the APV, we 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:

$$V_u + V_{txa} = D + E \tag{6.1}$$

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

[12] Free cash flow projections in the APV model are identical to those presented in Exhibit 6.4. Continuing value is computed using the key value driver formula. Only the cost of capital changes.

EXHIBIT 6.14 **Home Depot: Valuation Using Adjusted Present Value**

Year	Free cash flow ($ million)	Interest tax shield ($ million)	Discount factor (@ 9.3%)	Present value of FCF ($ million)	Present value of ITS ($ million)
2009	5,909	502	0.915	5,408	460
2010	2,368	498	0.838	1,984	417
2011	1,921	521	0.767	1,473	399
2012	2,261	549	0.702	1,587	385
2013	2,854	578	0.642	1,834	371
2014	3,074	604	0.588	1,807	355
2015	3,308	630	0.538	1,780	339
2016	3,544	657	0.493	1,746	323
2017	3,783	684	0.451	1,705	308
2018	4,022	711	0.413	1,660	293
Continuing value	78,175	14,064	0.413	32,256	5,803
Present value				53,240	9,454

Present value of FCF	53,240
Present value of interest tax shields	9,454
Present value of FCF and interest tax shields	62,694
Midyear adjustment factor	1.041
Value of operations	65,291
Value of excess cash	–
Value of long-term investments	361
Value of tax loss carry-forwards	112
Enterprise value	65,764
Less: Value of debt	(11,434)
Less: Value of capitalized operating leases	(8,298)
Equity value	46,032

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):

$$\underbrace{\frac{V_u}{V_u + V_{txa}} k_u}_{\text{Operating Assets}} + \underbrace{\frac{V_{txa}}{V_u + V_{txa}} k_{txa}}_{\text{Tax Assets}} = \underbrace{\frac{D}{D+E} k_d}_{\text{Debt}} + \underbrace{\frac{E}{D+E} k_e}_{\text{Equity}} \tag{6.2}$$

In the corporate-finance literature, academics combine Modigliani and Miller's two equations to solve for the cost of equity—to demonstrate the relationship between leverage and the cost of equity. In Appendix C, we algebraically rearrange equation 6.2 to solve for the levered cost of equity:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) - \frac{V_{txa}}{E}(k_u - k_{txa}) \tag{6.3}$$

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.

Determining the unlevered cost of equity with market data To use the APV, discount projected free cash flow at the unlevered cost of equity, k_u. Unfortunately, k_u cannot be observed directly. In fact, none of the variables on the left side of equation 6.2 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.

Method 1: Assume k_{txa} equals 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 equal the risk of operating assets ($k_{txa} = k_u$). Setting k_{txa} equal to k_u, equation 6.3 can be simplified as follows:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) \tag{6.4}$$

The unlevered cost of equity can now be solved using the observed cost of equity, the cost of debt, and the market debt-to-equity ratio.

Method 2: Assume k_{txa} equals k_d If you believe the market debt-to-equity ratio will not remain constant, then the value of interest tax shields will be more closely tied to the value of forecasted debt, rather than operating assets. In this case, the risk of tax shields is equivalent to the risk of debt. (When a company is unprofitable, it cannot use interest tax shields, the risk of default rises, and the value of debt drops.) Setting k_{txa} equal to k_d, equation 6.3 can be simplified as follows:

$$k_e = k_u + \frac{D - V_{txa}}{E}(k_u - k_d) \tag{6.5}$$

In this equation, the relationship between k_e and k_u relies on observable variables, such as the market value of debt, market value of equity, cost of debt, and cost of equity, as well as one unobservable variable: the present value of tax shields (V_{txa}). To use equation 6.5, discount expected future tax shields at the cost of debt (to remain consistent with the underlying assumption), and then solve for the unlevered cost of equity.

To avoid having to value the tax shields explicitly, many practitioners further refine the preceding equation by imposing an additional restriction: that the absolute dollar level of debt is constant. If the dollar level of debt is constant, V_{txa} simplifies to $D \times T_m$ (the market value of debt times the marginal tax rate), and equation 6.5 becomes:

$$k_e = k_u + (1 - T_m)\frac{D}{E}(k_u - k_d) \tag{6.6}$$

Although equation 6.6 is commonly used, its usefulness is limited because the assumptions are extremely restrictive.

Choosing the appropriate formula Which formula should you use to estimate the unlevered cost of equity, k_u? It depends on how you see the company managing its capital structure going forward and whether the debt is risk free. The majority of companies have relatively stable capital structures (as a percentage of expected value), so we strongly favor the first method.

In periods of high debt, such as financial distress and leveraged buyouts, the second method is appropriate. Yet even if a company's tax shields are predetermined for a given period, eventually they will track value. For instance, successful leveraged buyouts pay down debt for a period of time, but once the debt level becomes reasonable, debt will more likely track value than remain constant. Thus, even in situations where leverage is high, we recommend the first method.

Valuing Tax Shields and Other Capital Structure Effects

To complete an APV-based valuation, forecast and discount capital structure side effects such as tax shields, security issue costs, and distress costs. Since Home Depot 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 6.15). To calculate the expected interest payment in 2009, multiply the prior year's net debt of \$19.7 billion by the expected yield of 6.8 percent (net debt equals reported debt plus capitalized operating leases minus excess cash). This results in an expected interest payment of \$1.3 billion. Next, multiply the expected interest payment by the marginal tax rate of 37.6 percent, for an expected interest tax shield of \$502 million in 2009. To determine the continuing value of interest tax shields beyond 2018, use a growth perpetuity based on 2019 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

EXHIBIT 6.15 **Home Depot: Forecast of Interest Tax Shields**

Forecast year	Prior-year net debt ($ million)	Expected interest rate (percent)	Interest payment ($ million)	Marginal tax rate (percent)	Interest tax shield ($ million)
2009	19,732	6.8	1,337	37.6	502
2010	19,540	6.8	1,324	37.6	498
2011	20,447	6.8	1,386	37.6	521
2012	21,571	6.8	1,462	37.6	549
2013	22,683	6.8	1,537	37.6	578
2014	23,702	6.8	1,606	37.6	604
2015	24,739	6.8	1,676	37.6	630
2016	25,790	6.8	1,748	37.6	657
2017	26,854	6.8	1,820	37.6	684
2018	27,934	6.8	1,893	37.6	711
Continuing value	29,030	6.8	1,967	37.6	739

than the tax shields based on promised interest payments. To do this, reduce each promised tax shield by the cumulative probability of default.

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) are discounted at the unlevered cost of equity, k_u:

$$V = \sum_{t=1}^{\infty} \frac{\text{FCF}_t}{(1+k_u)^t} + \sum_{t=1}^{\infty} \frac{\text{ITS}_t}{(1+k_u)^t}$$

In 2000, 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.[13] He combined the two flows and named the resulting cash flow (FCF plus interest tax shields) capital cash flow (CCF):

$$V = \text{PV(Capital Cash Flows)} = \sum_{t=1}^{\infty} \frac{\text{FCT}_t + \text{ITS}_t}{(1+k_u)^t}$$

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

[13] Richard S. Ruback, "Capital Cash Flows: A Simple Approach to Valuing Risky Cash Flows," Social Science Research Network (March 2000).

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 models. Why? By keeping NOPLAT and FCF independent of leverage, we can 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 at the cost of equity, rather than at the weighted average cost of capital.[14]

Exhibit 6.16 details the cash flow to equity for Home Depot. 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. Alternatively, you can compute cash flow to equity as dividends plus share repurchases minus new equity issues. The two methods generate identical results.[15]

To value Home Depot, discount projected equity cash flows at the cost of equity (see Exhibit 6.17). 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.

[14] 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. We discuss valuing financial institutions in Chapter 36.

[15] 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 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 6.16 **Home Depot: Equity Cash Flow Summary**

$ million

	Historical			Forecast		
	2006	2007	2008	2009	2010	2011
Net income	5,761	4,395	2,260	2,183	2,477	2,947
Depreciation	1,645	1,693	1,785	1,639	1,685	1,778
Amortization	117	9	–	–	–	–
Gross cash flow	7,523	6,097	4,045	3,822	4,162	4,725
Change in operating working capital	(936)	1,066	–	292	(73)	(163)
Decrease (increase) in net long-term operating assets	(7,006)	4,152	(740)	329	(2,300)	(3,040)
Decrease (increase) in nonoperating assets	5	(324)	306	–	–	–
Decrease (increase) in net deferred tax liabilities	122	(715)	(284)	226	3	6
Increase (decrease) in short-term debt	(1,395)	2,029	(280)	75	107	107
Increase (decrease) in long-term debt	8,971	(260)	(1,716)	411	588	583
Cash flow to equity	7,284	12,045	1,331	5,155	2,486	2,218
Reconciliation of cash flow to equity						
Dividends	1,395	1,709	1,521	1,436	1,629	1,939
Share repurchases (net of stock issued)	5,889	10,336	(190)	3,719	856	279
Cash flow to equity	7,284	12,045	1,331	5,155	2,486	2,218

EXHIBIT 6.17 **Home Depot: Cash-Flow-to-Equity Valuation**

Forecast year	Cash flow to equity[1] ($ million)	Discount factor (@ 10.4%)	Present value of CFE ($ million)
2009	5,044	0.906	4,569
2010	2,486	0.821	2,040
2011	2,218	0.743	1,649
2012	2,498	0.673	1,682
2013	2,952	0.610	1,800
2014	3,145	0.552	1,738
2015	3,349	0.500	1,676
2016	3,556	0.453	1,612
2017	3,764	0.411	1,546
2018	3,974	0.372	1,478
Continuing value	63,569	0.372	23,646
Present value of cash flow to equity			43,436
Midyear adjustment amount			2,597
Equity value			46,032

[1] Cash flow to equity in 2009 excludes $111 million change in nonoperating deferred tax liabilities, as their value is incorporated elsewhere.

Once again, note how the valuation, derived using equity cash flows, matches each of the prior valuations. This occurs because we have modeled Home Depot'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 we did 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. 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.

Another 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.

OTHER APPROACHES TO DISCOUNTED CASH FLOW

In this chapter, we valued Home Depot by discounting nominal cash flows at a cost of capital based on observable interest rates. An alternative is to value companies by projecting cash flow in real terms (e.g., in constant 2009 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 29.

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 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, we have focused solely on discounted cash flow models. Two additional valuation techniques exist: multiples (comparables) and real options.

Multiples

Assume that you have been asked to value a company that is about to go public. Although you project and discount free cash flow to derive an enterprise value, you worry that your forecasts lack precision. One way to place your DCF model in the proper context is to create a set of comparables. One of the most commonly used comparables is the enterprise value (EV)–to–earnings before interest, taxes, and amortization (EBITA) multiple. To apply the EV/EBITA multiple, look for a set of comparable companies, and multiply a representative EV/EBITA multiple by the company's EBITA. For example, assume the company's EBITA equals $100 million and the typical EV/EBITA multiple in the industry is 9 times. Multiplying 9 by $100 million leads to an estimated value of $900 million. Is the enterprise DCF valuation near $900 million? If not, what enables the company to earn better (or worse) returns or to grow faster (or slower) than other companies in the industry?

Although the concept of multiples is simple, the methodology is misunderstood and often misapplied. In Chapter 14, we demonstrate how to build and interpret forward-looking comparables, independent of capital structure and other nonoperating items.

Real Options Using Replicating Portfolios

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. (Fischer Black would have been named as a third recipient, but the Nobel Prize is not awarded posthumously.) Their model relies on what today's economists call a "replicating portfolio." They argued that if there exists a portfolio 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 we can find a suitable replicating portfolio, we need not discount future cash flows.

Given the model's power, there have been many recent attempts to translate the concepts of replicating portfolios to corporate valuation. This valuation technique is commonly known as real options. Unlike those for financial options, however, replicating portfolios for companies and their projects are difficult to create. Therefore, although options-pricing models may teach powerful lessons, today's applications are limited. We cover valuation using options-based models in Chapter 32.

SUMMARY

This chapter described the most common DCF valuation models, with particular focus on the enterprise DCF model and the economic-profit model. We explained the rationale for each model and reasons why each model 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.

REVIEW QUESTIONS

1. Exhibit 6.18 presents the income statement and reorganized balance sheet for BrandCo, an $800 million consumer products company. Using the methodology outlined in Exhibit 6.5, determine NOPLAT for year 1. Assume an operating tax rate of 25 percent. Using the methodology outlined in Exhibit 6.6, determine free cash flow for year 1.

EXHIBIT 6.18 **BrandCo: Income Statement and Reorganized Balance Sheet**

$ million

Income statement	Today	Year 1	Reorganized balance sheet	Today	Year 1
Revenues	800.0	840.0	Operating working capital[1]	70.1	73.6
Operating costs	(640.0)	(672.0)	Property and equipment	438.4	460.3
Depreciation	(40.0)	(42.0)	Invested capital	508.5	533.9
Operating profit	120.0	126.0			
			Debt	200.0	210.0
Interest expense	(16.0)	(16.0)	Shareholders' equity	308.5	323.9
Earnings before taxes	104.0	110.0	Invested capital	508.5	533.9
Taxes	(26.0)	(27.5)			
Net income	78.0	82.5			

[1] Accounts payable has been netted against inventory to determine operating working capital.

2. BrandCo currently has 50 million shares outstanding. If BrandCo's shares are trading at $19.16 per share, what is the company's market capitalization (value of equity)? Assuming the market value of debt equals today's book value of debt, what percentage of the company's enterprise value is attributable to debt, and what percentage is attributable to equity? Using these weights, compute the weighted average cost of capital. Assume the pretax cost of debt is 8 percent, the cost of equity is 12 percent, and the marginal tax rate is 25 percent.
3. Using free cash flow computed in Question 1 and the weighted average cost of capital computed in Question 2, estimate BrandCo's enterprise value using the growing-perpetuity formula. Assume free cash flow grows at 5 percent.
4. Assuming the market value of debt equals today's book value of debt, what is the intrinsic equity value for BrandCo? What is the intrinsic value per share? Does it differ from the share price used to determine the cost of capital weightings?
5. What are the three components required to calculate economic profit? Determine BrandCo's economic profit in year 1.
6. Using economic profit calculated in Question 5 and the weighted average cost of capital computed in Question 2, value BrandCo using the economic-profit-based key value driver model. Does the calculation generate enterprise value or equity value? Should discounted economic profit be greater than, equal to, or less than discounted free cash flow? Hint: remember, prior-year invested capital must be used to determine ROIC and capital charge.
7. Using the methodology outlined in Exhibit 6.16, determine equity cash flow for year 1. Use the growing-perpetuity formula (based on equity cash flow) to compute BrandCo's equity value. Assume the cost of equity is 12 percent and cash flows are growing at 5 percent.

7

Reorganizing the Financial Statements

Traditional financial statements—the income statement, balance sheet, and statement of cash flows—are not organized for robust assessments of operating performance and value. The balance sheet mixes together operating assets, nonoperating assets, and sources of financing. The income statement similarly combines operating profits with the costs of financing, such as interest expense.

To prepare the financial statements for analysis of economic performance, you need to reorganize the items on the balance sheet, income statement, and statement of cash flows into three categories of components: operating, nonoperating, and sources of financing. This will entail 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, or hiding leverage that artificially boosts reported performance.

Since the process of reorganizing the financial statements is complex, this chapter proceeds in three steps. In step 1, we present a simple example demonstrating how to build invested capital, net operating profit less adjusted taxes (NOPLAT), and free cash flow (FCF). In the second step, we apply this method to the financial statements for Home Depot and Lowe's, commenting on some of the intricacies of implementation. In the final step, we provide 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 Five.

REORGANIZING THE ACCOUNTING STATEMENTS: KEY CONCEPTS

To calculate return on invested capital (ROIC) and free cash flow (FCF), we need to reorganize the balance sheet to create invested capital and likewise reorganize the income statement to create net operating profit less adjusted taxes (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 financial investors.

Return on invested capital and free cash flow 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, we can also 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 accountant's balance sheet is bound by the most fundamental rule of accounting:

$$\text{Assets} = \text{Liabilities} + \text{Equity}$$

Typically, assets consist primarily of operating assets (OA), such as receivables, inventory, and property, plant, and equipment. Liabilities consist of operating liabilities (OL), such as accounts payable and accrued salaries, and interest-bearing debt (D), such as notes payable and long-term debt. Equity (E) consists of common stock, possibly preferred stock, and retained earnings. Using this more explicit breakdown of assets, liabilities, and equity leads to an expanded version of the balance sheet relationship:

$$\text{Operating Assets} = \text{Operating Liabilities} + \text{Debt} + \text{Equity}$$

The traditional balance sheet equation, however, mixes operating liabilities and sources of financing on the right side of the equation. 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 reflect more accurately capital used for operations and the financing provided by investors to fund those operations. Note how invested capital can be calculated using the operating method—that is, operating assets minus operating liabilities—or the financing method, which equals debt plus equity.

For many companies, the previous equation is too simple. Assets consist of not only core 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). Expanding our original balance sheet equation:

$$\underset{\substack{\text{Operating}\\ \text{Assets}}}{\overset{\text{OA}}{}} + \underset{\substack{\text{Nonoperating}\\ \text{Assets}}}{\overset{\text{NOA}}{}} = \underset{\substack{\text{Operating}\\ \text{Liabilities}}}{\overset{\text{OL}}{}} + \underset{\substack{\text{Debt and}\\ \text{Its Equivalents}}}{\overset{\text{D + DE}}{}} + \underset{\substack{\text{Equity and}\\ \text{Its Equivalents}}}{\overset{\text{E + EE}}{}}$$

Rearranging leads to total funds invested:

$$\underset{\substack{\text{Invested}\\ \text{Capital}}}{\overset{\text{OA} - \text{OL}}{}} + \underset{\substack{\text{Nonoperating}\\ \text{Assets}}}{\overset{\text{NOA}}{}} = \underset{\substack{\text{Funds}\\ \text{Invested}}}{\overset{\text{Total}}{}} = \underset{\substack{\text{Debt and}\\ \text{Its Equivalents}}}{\overset{\text{D + DE}}{}} + \underset{\substack{\text{Equity and}\\ \text{Its Equivalents}}}{\overset{\text{E + EE}}{}}$$

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 7.1 rearranges the balance sheet into invested capital for a simple hypothetical company with only a few line items. A more sophisticated example, using real companies, is developed later in the chapter.

Net Operating Profit Less Adjusted Taxes: Key Concepts

To determine a company's after-tax operating profit, you need to compute net operating profit less adjusted taxes (NOPLAT). NOPLAT is the after-tax profit generated from core operations, excluding any gains 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,

EXHIBIT 7.1 **An Example of Invested Capital**

$ million

Accountant's balance sheet

	Prior year	Current year
Assets		
Inventory	200	225
Net PP&E	300	350
Equity investments	15	25
Total assets	515	600
Liabilities and equity		
Accounts payable	125	150
Interest-bearing debt	225	200
Common stock	50	50
Retained earnings	115	200
Total liabilities and equity	515	600

Invested capital

	Prior year	Current year	
Assets			
Inventory	200	225	
Accounts payable	(125)	(150)	Operating liabilities are netted against operating assets
Operating working capital	75	75	
Net PP&E	300	350	
Invested capital	375	425	
Equity investments	15	25	Nonoperating assets are not included in invested capital
Total funds invested	390	450	
Reconciliation of total funds invested			
Interest-bearing debt	225	200	
Common stock	50	50	
Retained earnings	115	200	
Total funds invested	390	450	

including providers of debt, equity, and any other types of investor financing. It is critical to define NOPLAT consistently with your definition of invested capital and include only those profits generated by invested capital.

To calculate NOPLAT, we reorganize the accountant's income statement (see Exhibit 7.2) in three fundamental ways. First, interest is not subtracted from operating profit, because interest is considered a payment to the company's financial investors, not an operating expense. By reclassifying interest as a financing item, we make NOPLAT independent of the company's capital structure.

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 caused by 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.

Since interest is tax deductible, leverage has value. But rather than factor tax shields into NOPLAT, we will account for all financing costs (including interest

EXHIBIT 7.2 **An Example of NOPLAT**

$ million

Accountant's income statement

	Current year
Revenues	1,000
Operating costs	(700)
Depreciation	(20)
Operating profit	280
Interest	(20)
Nonoperating income	4
Earnings before taxes	264
Taxes	(66)
Net income	198

NOPLAT

	Current year	
Revenues	1,000	
Operating costs	(700)	
Depreciation	(20)	
Operating profit	280	
Operating taxes[1]	(70)	Taxes are calculated on operating profits
NOPLAT	210	
After-tax nonoperating income[1]	3	Do not include income from any asset excluded from invested capital as part of NOPLAT
Income available to investors	213	
Reconciliation with net income		
Net income	198	
After-tax interest expense[1]	15	Treat interest as a financial payout to investors, not an expense
Income available to investors	213	

[1] Assumes a marginal tax of 25% on all income

and its tax shield) in the cost of capital. Similarly, taxes for nonoperating income must be accounted for and should be netted directly against nonoperating income, since they are not included as part of NOPLAT.

Free Cash Flow: Key Concepts

To value a company's operations, we discount projected free cash flow at an appropriate risk-adjusted 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 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:

$$\begin{aligned} \text{FCF} = {} & \text{NOPLAT} + \text{Noncash Operating Expenses} \\ & - \text{Investments in Invested Capital} \end{aligned}$$

As shown in Exhibit 7.3, free cash flow excludes nonoperating flows and items related to capital structure. Unlike the accountant's 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 (and its tax shield) is treated as a financing cash flow.

EXHIBIT 7.3 **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 equality investments	(10)
Cash flow from investing	(80)
Increase (decrease) in debt	(25)
Increase (decrease) in common stock	–
Dividends	(113)
Cash flow from financing	(138)

Free cash flow

	Current year	
NOPLAT	210	
Depreciation	20	
Gross cash flow	230	Subtract investments in operating items from gross cash flow
Decrease (increase) in inventory	(25)	
Increase (decrease) in accounts payable	25	
Capital expenditures	(70)	
Free cash flow	160	Evaluate cash flow from nonoperating assets separately from core operations
After-tax nonoperating Income	3	
Decrease (increase) in equity investments	(10)	
Cash flow available to investors	153	
Reconciliation of cash flow available to investors		Treat interest as a financial payout to investors, not an expense
After-tax interest	15	
Increase (decrease) in interest-bearing debt	25	
Increase (decrease) in common stock	–	
Dividends	113	
Cash flow available to investors	153	

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 you the same result can help you avoid line item omissions and classification pitfalls.

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 address these questions through an examination of Home Depot, the world's largest home improvement retailer, with stores located throughout North America, and comparison with Lowe's, a direct competitor of Home Depot. Home Depot has grown rapidly over the past 10 years, generating strong returns and cash flow. But its core markets have become increasingly saturated, the real estate market has soured, and the company now faces new challenges.

Invested Capital: In Practice

This section applies the process just outlined for reorganizing financial statements to the financial statements for Home Depot and Lowe's. It demonstrates how to compute invested capital and total funds invested, and how to reconcile the two methods for computing total funds invested.

Computing Invested Capital

To compute invested capital, first reorganize the company's balance sheet. In Exhibit 7.4, we present reorganized balance sheets for Home Depot and Lowe's. The reorganized versions we present are more detailed than the balance sheets reported in each company's respective annual reports, because we have searched the footnotes for information that enables us to disaggregate any accounts that mix together operating and nonoperating items. For instance, a search of Home Depot's 2007 notes reveals that the company aggregates equity investments, intangible assets, and long-term deferred taxes within the "other assets" line item (no description of other assets was provided in 2008).[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 (e.g., net property, plant, and equipment); intangible assets (e.g., goodwill); and net other long-term operating assets (net of long-term operating liabilities). Exhibit 7.5 demonstrates this line-by-line aggregation for Home Depot and Lowe's. 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

[1] According to Home Depot's 2007 10-K, "The Company purchased a 12.5% equity interest in the newly formed HD Supply for $325 million, which is included in Other Assets in the accompanying Consolidated Balance Sheets." Regarding acquired intangibles, "The Company's intangible assets at the end of fiscal 2007 and 2006, which are included in Other Assets in the accompanying Consolidated Balance Sheets, consisted of [$100 million in 2007] and [$778 million in 2006]."

EXHIBIT 7.4 **Home Depot and Lowe's: Historical Balance Sheets**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Assets						
Cash and cash equivalents	614	457	525	796	530	661
Receivables, net	3,223	1,259	972	–	–	–
Merchandise inventories	12,822	11,731	10,673	7,144	7,611	8,209
Short-term deferred tax assets	561	535	491	161	247	166
Other current assets	780	692	701	213	298	215
Total current assets	18,000	14,674	13,362	8,314	8,686	9,251
Net property and equipment	26,605	27,476	26,234	18,971	21,361	22,722
Goodwill	6,314	1,209	1,134	–	–	–
Notes receivable	343	342	36	165	509	253
Other assets: Equity investments	–	325	325	–	–	–
Other assets: Acquired intangibles	778	100	–	–	–	–
Other assets: Long-term deferred tax assets	7	–	4	–	–	–
Other assets: Undisclosed	216	198	69	317	313	460
Total assets	52,263	44,324	41,164	27,767	30,869	32,686
Liabilities and equity						
Short-term debt	18	2,047	1,767	111	1,104	1,021
Accounts payable	7,356	5,732	4,822	3,524	3,713	4,109
Accrued salaries	1,295	1,094	1,129	372	424	434
Deferred revenue	1,634	1,474	1,165	731	717	674
Short-term deferred tax liabilities	30	10	5	–	–	–
Other accrued expenses	2,598	2,349	2,265	1,801	1,793	1,784
Total current liabilities	12,931	12,706	11,153	6,539	7,751	8,022
Long-term debt	11,643	11,383	9,667	4,325	5,576	5,039
Deferred income taxes	1,416	688	369	735	670	660
Other long-term liabilities	1,243	1,833	2,198	443	774	910
Common stock and paid-in capital	8,051	5,885	6,133	864	745	1,012
Retained earnings	33,052	11,388	12,093	14,860	15,345	17,049
Accumulated other comprehensive income	310	755	(77)	1	8	(6)
Treasury stock	(16,383)	(314)	(372)	–	–	–
Total liabilities and shareholders' equity	52,263	44,324	41,164	27,767	30,869	32,686

represents temporary imbalances in the company's cash position and is discussed 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),

[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.

EXHIBIT 7.5 **Home Depot and Lowe's: Invested Capital Calculations**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Total funds invested: Uses						
Operating cash	614	457	525	796	530	661
Receivables, net	3,223	1,259	972	–	–	–
Merchandise inventories	12,822	11,731	10,673	7,144	7,611	8,209
Other current assets	780	692	701	213	298	215
Operating current assets	17,439	14,139	12,871	8,153	8,439	9,085
Accounts payable	(7,356)	(5,732)	(4,822)	(3,524)	(3,713)	(4,109)
Accrued salaries	(1,295)	(1,094)	(1,129)	(372)	(424)	(434)
Deferred revenue	(1,634)	(1,474)	(1,165)	(731)	(717)	(674)
Other accrued expenses	(2,598)	(2,349)	(2,265)	(1,801)	(1,793)	(1,784)
Operating current liabilities	(12,883)	(10,649)	(9,381)	(6,428)	(6,647)	(7,001)
Operating working capital	4,556	3,490	3,490	1,725	1,792	2,084
Net property and equipment	26,605	27,476	26,234	18,971	21,361	22,722
Capitalized operating leases[1]	9,141	7,878	8,298	3,034	3,528	3,913
Other long-term assets, net of liabilities	(1,027)	(1,635)	(2,129)	(126)	(461)	(450)
Invested capital (excluding goodwill and acquired intangibles)	39,275	37,209	35,893	23,604	26,220	28,269
Goodwill and acquired intangibles	7,092	1,309	1,134	–	–	–
Cumulative amortization and unrecorded goodwill[2]	177	49	49	730	730	730
Invested capital	46,543	38,567	37,075	24,334	26,950	29,000
Excess cash	–	–	–	–	–	–
Nonconsolidated investments	343	667	361	165	509	253
Tax loss carry-forwards[3]	66	101	124	(33)	(1)	(56)
Total funds invested	46,952	39,335	37,560	24,466	27,458	29,197
Total funds invested: Sources						
Short-term debt	18	2,047	1,767	111	1,104	1,021
Long-term debt	11,643	11,383	9,667	4,325	5,576	5,039
Capitalized operating leases[1]	9,141	7,878	8,298	3,034	3,528	3,913
Debt and debt equivalents	20,802	21,308	19,732	7,470	10,208	9,973
Deferred income taxes: operating[3]	480	105	114	541	422	438
Deferred income taxes: nonoperating[3]	464	159	(111)	–	–	–
Cumulative amortization and unrecorded goodwill[2]	177	49	49	730	730	730
Common stock and paid-in capital	8,051	5,885	6,133	864	745	1,012
Retained earnings	33,052	11,388	12,093	14,860	15,345	17,049
Accumulated other comprehensive income	310	755	(77)	1	8	(6)
Treasury stock	(16,383)	(314)	(372)	–	–	–
Equity and equity equivalents	26,151	18,027	17,829	16,996	17,250	19,223
Total funds invested	46,952	39,335	37,560	24,466	27,458	29,197

[1] Capitalized operating lease adjustments are detailed in Exhibit 7.14.
[2] Goodwill and cumulative amortization adjustments are detailed in Exhibit 7.6.
[3] Deferred tax adjustments are detailed in Exhibit 7.8.

customers (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. Interest-bearing liabilities are nonoperating and should *not* be netted from operating assets.

Some argue that operating liabilities, such as accounts payable, are a form of financing and should be treated no differently than debt. However, this 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.[4]

Net property, plant, and equipment 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 8.

Net other operating assets If other long-term assets and liabilities are small—and not detailed by the company—we can 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, intangible assets related to pensions, nonconsolidated subsidiaries, and other equity investments. Nonoperating items should not be included in invested capital. Long-term liabilities might similarly include operating and nonoperating items. Operating liabilities are liabilities that result directly from an ongoing operating activity. For instance, Home Depot warranties some products 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

[3] Retailers, such as Home Depot and Lowe's, receive customer prepayments from gift cards, prepaid product installations, and anticipated customer returns (for which funds are received but revenue is not recognized).

[4] Alternatively, we could compute return on operating assets by adding back to NOPLAT the estimated financing cost associated with any operating liabilities. This approach, however, is unnecessarily complex, requires information not readily available, and fails to provide additional insight.

deem debt and equity equivalents. These include 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 2007, Home Depot aggregated a nonoperating equity investment (HD Supply) within other assets. This was reported solely in the 2007 footnote titled, "Disposition and Acquisitions."

Goodwill and acquired intangibles In Chapter 8, 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, Belgian brewer InBev has a lower ROIC with goodwill and acquired intangibles than Dutch brewer Heineken, but this difference is attributable to premiums InBev paid to acquire breweries, not poor operating performance. When ROIC is computed without goodwill and acquired intangibles, InBev's operating performance is best in class. 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. 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.[5] (To maintain consistency, amortization and impairments will not be deducted from revenues to determine NOPLAT.) In Exhibit 7.6, amortization and impairments dating back to 1999 are added back to Home Depot's recorded goodwill and acquired intangibles. For instance, Home Depot reported \$117 million in amortization in 2006. This amount was added to the 2005 cumulative amortization of \$60 million to give a total of \$177 million in cumulative amortization for 2006.[6] In 2007, Home Depot sold a subsidiary, HD Supply, to a consortium of investors. Subsequently, goodwill, acquired intangibles, and cumulative amortization all dropped. In 2008,

[5] The implementation of new accounting standards (in 2001 for the United States and 2005 for Europe) radically changed the way companies account for acquisitions. Today, whether paid in cash or in stock, 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.

[6] The calculation of cumulative amortization and impairments will not always match cumulative amortization reported in the company's financial statements, since reported cumulative amortization does not include impairments.

EXHIBIT 7.6 **Home Depot and Lowe's: Adjustments to Goodwill and Acquired Intangibles**

$ million

	2004	2005	2006	2007	2008
Home Depot					
Goodwill	1,394	3,286	6,314	1,209	1,134
Acquired intangibles	–	398	778	100	–
Unrecorded goodwill related to pooling	–	–	–	–	–
Cumulative amortization and impairments	31	60	177	49	49
Adjusted goodwill and acquired intangibles	1,425	3,744	7,269	1,358	1,183
Lowe's					
Goodwill	–	–	–	–	–
Acquired intangibles	–	–	–	–	–
Unrecorded goodwill related to pooling	730	730	730	730	730
Cumulative amortization and impairments	–	–	–	–	–
Adjusted goodwill and acquired intangibles	730	730	730	730	730

Home Depot did not provide details on acquired intangibles or amortization, so cumulative amortization was left constant.

The second adjustment required is to add to recorded goodwill any unrecorded goodwill (due to the old pooling of interest/merger accounting). Consider Lowe's acquisition of Eagle Garden & Hardware in 1998. Since the acquisition was recorded using pooling, no goodwill was recognized. Had Lowe's used purchase accounting, the company would have recorded $730 million in goodwill.[7] To include pooling transactions, estimate and record the incremental goodwill while simultaneously adjusting equity to represent the value of shares given away. Exhibit 7.6 shows Lowe's recapitalized goodwill from the Eagle Garden & Hardware acquisition.

Not all intangible assets are generated through corporate acquisitions. Consider purchased customer contracts, for example. Companies sometimes purchase customer contracts from distributors or competitors. In these cases, the purchase cost is recognized as an intangible asset and amortized over the life of the contract.

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, certain financing receivables (e.g., credit card receivables), nonconsolidated

[7] On the final day of trading, Eagle had 29.1 million shares outstanding at a price of $37.75. Thus, Lowe's paid approximately $1.1 billion. According to its last 10-Q, Eagle had only $370 million in total equity. Pooled goodwill equals $1.1 billion less $370 million, or $730 million.

subsidiaries, and excess pension assets. Summing invested capital and nonoperating assets leads to total funds invested.

We next evaluate various types of nonoperating assets, beginning with excess cash and marketable securities.

Excess cash and marketable securities Do not include excess cash in invested capital. By its definition, excess cash is unnecessary for core operations. Rather 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 accountant's definition of cash versus marketable securities distinguish working cash from excess cash. To estimate the size of working cash, we examined the cash holdings of the S&P 500 nonfinancial companies. Between 1993 and 2000, the 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] Neither Home Depot nor Lowe's carried excess cash in 2007, although they each held as much as $1.5 billion in the early 2000s.

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 comparison with other companies impossible.

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

[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.

and not revenue is recorded, including nonconsolidated subsidiaries as part of operations will distort margins and capital turnover. Therefore, we recommend separating nonconsolidated subsidiaries from invested capital and analyzing and valuing nonconsolidated subsidiaries separately from core operations.

Prepaid and intangible 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, 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. We examine pension assets in detail in Chapter 27.

Tax loss carry-forwards Treat tax loss carry-forwards—also known as net operating losses (NOLs)—as a nonoperating asset. The treatment of deferred taxes is discussed in more detail in a subsequent subsection.

Other nonoperating assets Other nonoperating assets, such as excess real estate and discontinued operations, also should be excluded from invested capital.

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 net debt, equity, and their equivalents. The totals produced by the two approaches should reconcile. A summary of sources of financing is presented in Exhibit 7.7. We next examine each of these sources of capital contributing to total funds invested.

EXHIBIT 7.7 **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 owner's equity (e.g., convertible debt and employee options)
Minority 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)

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. Rather, we 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. Treating unfunded retirement expenses as debt might seem hypothetical, but for some companies, the issue has become real. In June 2003, General Motors issued $17 billion in debt, using the proceeds to reduce its pension shortfall, not to fund operations.[9]

Other debt equivalents, such as reserves for plant decommissioning and restructuring, are discussed in Chapter 26.

Hybrid securities Hybrid securities are claims against enterprise value that have characteristics similar to equity but are not part of current equity. The three most common hybrid securities are convertible debt, preferred stock, and employee options.

Minority interest A minority interest occurs when a third party owns some percentage of one of the company's consolidated subsidiaries. If a minority interest exists, treat the balance sheet amount as an equity equivalent. Treat the earnings attributable to any minority 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 and aggregate unrealized gains and losses from liquid assets whose value has changed but that have not yet been sold. 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 retained

[9] R. Barley and C. Evans, "GM Plans Record Bond Sale Thursday to Plug Pension Gap," Reuters News, June 26, 2003.

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 investors and the government account for taxes. For instance, the government typically uses accelerated depreciation to determine a company's tax burden, 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 burden. To avoid this bias, use cash taxes to determine NOPLAT. Since reported taxes will now match cash taxes, the deferred tax account 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, but only deferred tax assets (DTAs) and liabilities (DTLs) *associated with ongoing operations.*[10] 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. *Tax loss carry-forwards:* Nonoperating tax assets such as tax loss carry-forwards should be treated as nonoperating assets.
2. *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. They will be used to compute operating cash taxes in the next section.
3. *Nonoperating deferred tax assets and liabilities:* Treat deferred tax liabilities (net of deferred tax assets) related to accounting conventions (such as acquired intangibles), nonoperating assets (such as pensions), or financial liabilities (such as convertible debt) as equity equivalents, but do *not* include them in cash taxes.

Exhibit 7.8 uses Home Depot's deferred tax footnote to disaggregate deferred taxes into tax loss carry-forwards, operating DTLs, and nonoperating DTLs. Tax loss carry-forwards totaled \$124 million in 2008. Tax loss carry-forwards are a nonoperating asset and are treated as such when reorganizing the balance sheet in Exhibit 7.5. Operating deferred tax liabilities totaled \$114 million in 2008. These liabilities include accounts related to accelerated

[10] Separating deferred taxes into operating and nonoperating items is a complex task and requires advanced knowledge of accounting conventions. For an in-depth discussion of deferred taxes, see Chapter 25.

EXHIBIT 7.8 **Home Depot: Deferred-Tax Assets and Liabilities**

$ million

Reported in Home Depot 10-K notes

	2006	2007	2008
Assets			
Accrued self-insurance liabilities	419	440	460
State income taxes	–	105	118
Other accrued liabilities	603	601	490
Net operating losses	66	108	136
Other deferred-tax assets	–	54	307
Deferred-tax assets	1,088	1,308	1,511
Valuation allowance	–	(7)	(12)
Net deferred-tax assets	1,088	1,301	1,499
Liabilities			
Accelerated depreciation	(1,365)	(1,133)	(1,068)
Accelerated inventory deduction	(137)	(118)	(114)
Goodwill and other intangibles	(361)	(69)	(78)
Other deferred-tax liabilities	(103)	(144)	(118)
Deferred-tax liabilities	(1,966)	(1,464)	(1,378)
Deferred-tax assets (liabilities)	(878)	(163)	121

Reorganized financials

	2006	2007	2008
Tax loss carry-forwards			
Net operating losses	66	108	136
Valuation allowance	–	(7)	(12)
Tax loss carry-forwards	66	101	124
Operating deferred taxes			
Accelerated depreciation	(1,365)	(1,133)	(1,068)
Accelerated inventory deduction	(137)	(118)	(114)
Accrued self-insurance liabilities	419	440	460
State income taxes	–	105	118
Other accrued liabilities	603	601	490
Operating deferred-tax assets (liabilities)	(480)	(105)	(114)
Nonoperating deferred taxes			
Goodwill and other intangibles	(361)	(69)	(78)
Other deferred-tax liabilities	(103)	(144)	(118)
Other deferred-tax assets	–	54	307
Nonoperating deferred-tax assets (liabilities)	(464)	(159)	111
Deferred-tax assets (liabilities)	(878)	(163)	121

Source: Home Depot 10-K notes, 2006–2008.

depreciation, inventory valuation, and self-insurance. Operating DTLs are treated as an equity equivalent in Exhibit 7.5, and the change in operating DTLs will be the basis for computing cash taxes later in this chapter. The remaining items are classified as nonoperating deferred tax liabilities.

NOPLAT: In Practice

This section details how to calculate net operating profits less adjusted taxes (NOPLAT) and how to reconcile this figure with net income. NOPLAT represents total income generated from operations available to all investors.

Calculating NOPLAT

To determine NOPLAT for Home Depot and Lowe's, we turn to their respective income statements (see Exhibit 7.9) and convert the income statement into NOPLAT (see Exhibit 7.10).

Net operating profit (NOP or EBITA) NOPLAT starts with earnings before interest, taxes, and amortization of acquired intangibles (EBITA), which equals

EXHIBIT 7.9 **Home Depot and Lowe's: Historical Income Statement**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Net sales	90,837	77,349	71,288	46,927	48,283	48,230
Cost of merchandise sold	(61,054)	(51,352)	(47,298)	(30,729)	(31,556)	(31,729)
Selling, general, and administrative	(18,348)	(17,053)	(17,846)	(9,884)	(10,656)	(11,176)
Depreciation	(1,645)	(1,693)	(1,785)	(1,162)	(1,366)	(1,539)
Amortization	(117)	(9)	–	–	–	–
EBIT	9,673	7,242	4,359	5,152	4,705	3,786
Interest and investment income	27	74	18	52	45	40
Interest expense	(392)	(696)	(624)	(206)	(239)	(320)
Nonrecurring charge	–	–	(163)	–	–	–
Earnings before taxes	9,308	6,620	3,590	4,998	4,511	3,506
Income taxes	(3,547)	(2,410)	(1,278)	(1,893)	(1,702)	(1,311)
Earnings from continuing operations	5,761	4,210	2,312	3,105	2,809	2,195
Discontinued operations	–	185	(52)	–	–	–
Net income	5,761	4,395	2,260	3,105	2,809	2,195

revenue less operating expenses (e.g., cost of goods sold, selling costs, general and administrative costs, depreciation).

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 loses economic value over time, depreciation must be included as an operating expense when determining NOPLAT.

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 brands are *expensed* and not capitalized. Thus, when the acquired intangible loses value and is replaced through further investment, the reinvestment is 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 some companies, nonoperating gains and 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 gains (or losses) related to pensions, embedded interest expenses from operating leases, and restructuring charges hidden in the cost of sales. Each of these is briefly addressed at the end of this chapter and in detail in the chapters in Part Five covering advanced valuation issues.

EXHIBIT 7.10 **Home Depot and Lowe's: NOPLAT Calculation**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Income statement						
Net sales	90,837	77,349	71,288	46,927	48,283	48,230
Cost of merchandise sold	(61,054)	(51,352)	(47,298)	(30,729)	(31,556)	(31,729)
Selling, general, and administrative	(18,348)	(17,053)	(17,846)	(9,884)	(10,656)	(11,176)
Depreciation	(1,645)	(1,693)	(1,785)	(1,162)	(1,366)	(1,539)
EBITA	9,790	7,251	4,359	5,152	4,705	3,786
Add: Operating lease interest[3]	441	536	486	185	169	199
Adjusted EBITA	10,231	7,787	4,845	5,337	4,874	3,985
Operating cash taxes	(3,986)	(3,331)	(1,811)	(2,071)	(1,973)	(1,496)
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489
Operating cash taxes						
Operating taxes[1]	3,873	2,956	1,820	2,043	1,854	1,512
Increase (decrease) in operating deferred taxes[2]	113	375	(9)	28	119	(16)
Operating cash taxes	3,986	3,331	1,811	2,071	1,973	1,496
Reconciliation with net income						
Net income	5,761	4,395	2,260	3,105	2,809	2,195
Decrease (increase) in operating deferred taxes[2]	(113)	(375)	9	(28)	(119)	16
Adjusted net income	5,648	4,020	2,269	3,077	2,690	2,211
After-tax interest expense	244	432	390	127	148	199
After-tax operating lease interest expense[3]	274	333	303	114	105	124
Total income available to investors	6,166	4,784	2,962	3,318	2,943	2,533
Nonoperating taxes	23	(103)	(71)	(20)	(14)	(19)
Loss (gain) from discontinued operations	–	(185)	52	–	–	–
After-tax nonrecurring charges	–	–	102	–	–	–
After-tax amortization of intangibles	73	6	–	–	–	–
After-tax interest income	(17)	(46)	(11)	(32)	(28)	(25)
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489

[1] Operating taxes calculation detailed in Exhibit 7.12.
[2] Operating deferred tax liabilities, net of operating deferred tax assets.
[3] Operating lease interest detailed in Exhibit 7.14.

Operating cash taxes Since nonoperating items also affect reported taxes, they must be *adjusted* to an all-equity, operating level. Since interest expense is deductible before taxes, highly leveraged companies will have smaller tax burdens. Although a smaller tax burden will lead to a higher valuation, we recommend valuing financing effects in the weighted average cost of capital (WACC) or valuing them separately using adjusted present value (APV)—but not as part of after-tax operating profit.

The reasons for adjusting taxes are quite complex. In Chapter 25, we provide an in-depth explanation of the process we recommend for computing operating cash taxes. In this chapter, we focus on the simplest method. To estimate operating taxes, proceed in three steps:

1. Search the footnotes for the tax reconciliation table. For tables presented in dollars, build a second reconciliation table in percent, and vice versa. Data from both tables are necessary to complete the remaining steps.
2. Using the percent-based tax reconciliation table, determine the marginal tax rate. 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 Home Depot. Start by converting the reported tax reconciliation table to percentages. The results of this conversion are presented in the right-hand half of Exhibit 7.11. To convert a line item from dollars to percent, divide the line item by *earnings before taxes* ($3,590 million in 2008). Earnings before taxes are reported on the income statement.

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 taxes to calculate a proxy for the marginal rate. In 2008, Home Depot paid 37.6 percent in federal (35.0 percent) and state (2.6 percent) taxes. Use this marginal rate to compute taxes on adjusted EBITA. Exhibit 7.12 presents the calculation of marginal taxes on adjusted EBITA for Home Depot. In 2008, taxes on adjusted EBITA equaled $1,820 million (37.6 percent times $4,845 million in EBITA).

After computing taxes on adjusted EBITA, search the dollar-based reconciliation table for other operating taxes. For Home Depot, the only operating taxes

EXHIBIT 7.11 **Home Depot: Tax Reconciliation Tables**

$ million	2006	2007	2008
Tax reconciliation			
Income taxes at statutory rate	3,258	2,317	1,257
State income taxes, net of federal	261	196	92
Foreign rate differences	5	–	–
Other, net	23	(103)	(71)
Reported taxes	3,547	2,410	1,278
Earnings before taxes	9,308	6,620	3,590

	percent	2006	2007	2008
Step 1:	**Reformatted tax reconciliation**			
	Income taxes at statutory rate	35.0	35.0	35.0
	State income taxes, net of federal	2.8	3.0	2.6
	Foreign rate differences	0.1	–	–
	Other, net	0.2	(1.6)	(2.0)
	Reported taxes	38.1	36.4	35.6

Source: Home Depot 2008 10-K, note 6.

EXHIBIT 7.12 **Home Depot: Operating Taxes and Operating Cash Taxes**

$ million

		2004	2005	2006	2007	2008
Operating taxes						
Step 2:	Marginal tax rate (percent)	37.7	38.0	37.8	38.0	37.6
	× Adjusted EBITA	8,214	9,731	10,231	7,787	4,845
	= Marginal taxes on EBITA	3,098	3,698	3,868	2,956	1,820
Step 3:	Other operating taxes	(17)	(10)	5	–	–
	Operating taxes	3,081	3,688	3,873	2,956	1,820
Operating cash taxes						
	Operating taxes	3,081	3,688	3,873	2,956	1,820
	Increase in operating deferred taxes[1]	(548)	668	113	375	(9)
	Operating cash taxes	2,533	4,356	3,986	3,331	1,811

[1] Increase in operating deferred tax liabilities, net of operating deferred tax assets, as reported in Exhibit 7.8

paid beyond marginal taxes were foreign rate differences.[11] In 2006, foreign rate differences resulted in $5 million of additional operating taxes. Therefore, increase taxes on adjusted EBITA by $5 million to determine operating taxes in 2006.

The tax reconciliation table for Home Depot is quite simple and requires few adjustments. For large multinationals, however, the tax footnote can be complex and may require multiple adjustments.

Adjusting for cash taxes We recommend using operating cash taxes actually paid, if possible, rather than accrual-based taxes reported.[12] The simplest way to calculate cash taxes is to subtract the increase in *net operating deferred tax liabilities* (DTLs) from operating taxes. Exhibit 7.8 separates Home Depot's net operating DTLs from its nonoperating DTLs. Home Depot's net operating DTLs have been falling over the past few years, so reported taxes understate actual cash taxes. Subtracting (or adding) the annual increase (or decrease) in deferred taxes gives cash taxes. In 2008, operating taxes were decreased by $9 million because *operating* deferred tax liabilities rose from $105 million to $114 million, as reported in Exhibit 7.8.

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

[11] 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.

[12] 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.

taxes might be double-counted: once in NOPLAT and potentially again as part of the corresponding item.[13] Also, deferred tax accounts rise and fall as a result of acquisitions and divestitures. However, only organic increases in deferred taxes should be included in cash taxes, not increases resulting from consolidation. For companies involved in multiple mergers and acquisitions, a clean measure of cash taxes may be impossible to calculate. When this is the case, use operating taxes rather than cash taxes.

Reconciliation to Net Income

To ensure that the reorganization is complete, we recommend reconciling net income to NOPLAT (see the lower half of Exhibit 7.10). To reconcile NOPLAT, start with net income, and add back (or subtract) the increase (or decrease) in operating deferred tax liabilities. Next, add back after-tax interest expense from both debt and capitalized operating leases. This determines the income available to all investors. To calculate NOPLAT, add back nonoperating expenses (such as nonoperating taxes, after-tax nonrecurring charges, and the after-tax amortization of intangibles), and subtract after-tax gains and income from nonoperating assets. We do this for Home Depot and Lowe's in Exhibit 7.10.

Nonoperating income, gains, and losses To remain consistent with the calculation of invested capital, calculate NOPLAT without interest income and without gains or losses from the corresponding assets that have been excluded. Historical returns on excess cash and other nonoperating assets should be calculated and evaluated separately.

Free Cash Flow: In Practice

This subsection details how we build free cash flow from Home Depot and Lowe's reorganized financial statements. It shows how to add in cash flow from nonoperating assets to arrive at cash flow available to investors and how to reconcile that sum with the total flow of financing.

Calculating Free Cash Flow

Free cash flow is defined as:

$$\text{FCF} = \text{NOPLAT} + \text{Noncash Operating Expenses} \\ - \text{Investments in Invested Capital}$$

[13] For instance, cash flow related to future taxes on pension shortfalls should be computed using projected contributions, not on the historical deferred tax account.

EXHIBIT 7.13 **Home Depot and Lowe's: Free Cash Flow Calculation**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
NOPLAT	6,245	4,456	3,033	3,266	2,901	2,489
Depreciation	1,645	1,693	1,785	1,162	1,366	1,539
Gross cash flow	7,890	6,149	4,818	4,428	4,267	4,028
Change in operating working capital	(936)	(739)	–	168	(67)	(292)
Net capital expenditures	(3,349)	(3,577)	(543)	(3,779)	(3,756)	(2,900)
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	291	(494)	(385)
Investments in goodwill and acquired intangibles	(3,525)	–	175	–	–	–
Decrease (increase) in net long-term operating assets	224	457	494	52	335	(11)
Increase (decrease) in accumulated other comprehensive income	(99)	445	(832)	–	7	(14)
Gross investment	(8,899)	(2,152)	(1,125)	(3,268)	(3,975)	(3,602)
Free cash flow	(1,009)	3,998	3,693	1,160	292	426
After-tax interest income	17	46	11	32	28	25
After-tax nonrecurring charge	–	–	(102)	–	–	–
Loss (gain) from discontinued operations	–	185	(52)	–	–	–
Nonoperating taxes	(23)	103	71	20	14	19
Decrease (increase) in excess cash	–	–	–	11	–	–
Decrease (increase) in long-term investments	5	(324)	306	129	(344)	256
Decrease (increase) in net loss carry-forwards	(3)	(35)	(23)	(6)	(32)	55
Sale of HD Supply	–	8,743	–	–	–	–
Nonoperating cash flow	(4)	8,718	211	186	(334)	355
Cash flow available to investors	(1,013)	12,716	3,904	1,346	(42)	781
After-tax interest expense	244	432	390	127	148	199
After-tax operating lease interest expense	274	333	303	114	105	124
Decrease (increase) in short-term debt	1,395	(2,029)	280	(79)	(993)	83
Decrease (increase) in long-term debt	(8,971)	260	1,716	(826)	(1,251)	537
Decrease (increase) in capitalized operating leases	(1,214)	1,262	(419)	291	(494)	(385)
Flows to debt holders	(8,272)	258	2,269	(373)	(2,485)	557
Decrease (increase) in nonoperating deferred taxes	(282)	302	270	–	–	–
Dividends	1,395	1,709	1,521	276	428	491
Repurchased and retired shares	5,889	10,336	(190)	1,400	2,007	(267)
Adjustments to retained earnings	257	111	34	43	8	–
Flows to equity holders	7,259	12,458	1,635	1,719	2,443	224
Cash flow available to investors	(1,013)	12,716	3,904	1,346	(42)	781

[1] Increase in nonoperating deferred tax liabilities, net of nonoperating deferred tax assets

Exhibit 7.13 builds the free cash flow calculation and reconciles free cash flow to cash flow available to investors for both Home Depot and Lowe's. The components of free cash flow are gross cash flow, investments in invested capital, and effects of acquisitions and divestitures.

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 noncash expenses. The two most common noncash expenses are depreciation and noncash employee compensation. Do not add back intangibles amortization 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 equals investments in property, plant, and equipment (PP&E), less the book value of any PP&E sold. Net capital expenditures are estimated by adding the increase in net PP&E to depreciation. 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.
4. *Investment in goodwill and acquired intangibles:* For acquired intangible assets, where cumulative amortization has been added back, we 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 in 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 effect," which under U.S. GAAP and IFRS is found within the "accumulated other comprehensive income" (OCI) account.[14] By subtracting the increase, we undo the effect of changing exchange rates.

Effect of acquisitions and divestitures Another effect that contributes to the change in balance sheet accounts is restatements due to acquisitions and divestitures. For instance, Home Depot divested its HD Supply business in 2007 for approximately $8 billion. This caused an artificial drop in many accounts on the balance sheet, such as inventory, even though the company continued to invest in these accounts. As an example, consider merchandise inventories reported in Exhibit 7.4. The account decreased by $1.1 billion from $12,822 million in 2006 to $11,731 million in 2007. From a cash perspective, however, the company reported (in their 2007 cash flow from operating activities) an investment of $491 million in inventory. To reconcile the change in accounts with the actual cash expenditures, the difference of $1,582 million was reallocated to "sale of HD Supply" and recorded as a nonoperating cash flow.[15] Although not shown, adjustments related to the sale of HD Supply in 2007 are made to a number of accounts, including receivables, inventories, accounts payable, deferred revenues, PP&E, goodwill, and acquired intangibles.

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:

$$\begin{array}{c} \text{Present Value} \\ \text{of Company's} \\ \text{Free Cash Flow} \end{array} + \begin{array}{c} \text{Value of} \\ \text{Nonoperating} \\ \text{Assets} \end{array} = \begin{array}{c} \text{Total Value} \\ \text{of} \\ \text{Enterprise} \end{array}$$

[14] In the 2008 annual report, Home Depot reported that "Accumulated Other Comprehensive Income consists primarily of foreign currency translation adjustments." Therefore, the change in accumulated other comprehensive income is included in gross investment in Exhibit 7.13.

[15] 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.

To reconcile free cash flow with total cash flow available to investors, include the following nonoperating cash flows:

- *Cash flow related to excess cash and marketable securities:* Excess cash and marketable securities generate cash flow through interest income and asset sales. When you add investment income to cash flow, it must be added back on an after-tax basis, using the marginal tax rate.
- *Cash flow from other nonoperating assets:* Add other nonoperating income and gains (or subtract losses) less increases in other nonoperating assets (or plus decreases). It is best to combine nonoperating income and changes in nonoperating assets; otherwise, a distorted picture could emerge. Consider a company that impaired a $100 million equity investment. If we examine the change in equity investments alone, it appears that the company sold $100 million in nonoperating assets. But this assessment is misleading because no cash actually changed hands; the asset was merely marked down. If we combine the $100 million change (positive cash flow) with the $100 million reported loss (negative cash flow) from the income statement, we see the true impact is zero.

Reconciling Cash Flow Available to Investors

Cash flow available to investors should be identical to 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:

- *After-tax interest expenses:* After-tax interest should be treated as a financing flow. When computing after-tax interest, use the same marginal tax rate used for NOPLAT.
- *Debt issues and repurchases:* 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.
- *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, we focus on the aggregate change of the four accounts combined. In Exhibit 7.13, we refer to the aggregate change as "repurchased and retired shares."

- *Change in debt equivalents:* Since accrued pension liabilities and accrued postretirement medical liabilities are considered debt equivalents (see Chapter 27 for more on issues related to pensions and other postretirement benefits), their changes should be treated as a financing flow. Equity equivalents such as operating deferred taxes should not be included in the financing flow, because they are already included as part of NOPLAT.

ADVANCED ANALYTICAL ISSUES

Until now, we have focused on the issues you will typically encounter when analyzing a company. Depending on the company, you may come across difficult (and technical) accounting issues that can affect the estimation of NOPLAT, invested capital, and free cash flow. In this section, we summarize a set of advanced analytical topics, including operating leases, pensions, capitalized research and development (R&D), restructuring charges, and restructuring reserves. Although we provide a brief summary of these topics here, each one is discussed in depth in the chapters of Part Five, "Advanced Valuation Issues." Note, however, that not every 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.

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 asset's rental charge as an expense and reports future commitments in the notes. To compare asset intensity meaningfully 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 27 evaluates alternatives for estimating value. We focus on one in particular: multiplying rental expense by an appropriate capitalization factor, based on the cost of debt (k_d) and average asset life.[16] As shown in Chapter 27, the asset value can be estimated as:

$$\text{Asset Value}_{t-1} = \left(\frac{\text{Rental Expense}_t}{k_d + \frac{1}{\text{Asset Life}}}\right)$$

[16] Chapter 27 derives an appropriate capitalization factor based on the cost of secured debt and average asset life.

EXHIBIT 7.14 **Home Depot and Lowe's: Capitalizing Operating Leases**

$ million

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
EBITA						
EBITA	9,790	7,251	4,359	5,152	4,705	3,786
Implied interest[1]	441	536	486	185	169	199
Adjusted EBITA	10,231	7,787	4,845	5,337	4,874	3,985
Operating cash taxes						
Operating cash taxes	3,819	3,128	1,629	2,000	1,909	1,420
Tax shield on operating lease interest expense	167	204	182	71	64	76
Adjusted operating cash taxes	3,986	3,331	1,811	2,071	1,973	1,496
NOPLAT						
NOPLAT (using rental expense)	5,971	4,123	2,730	3,152	2,796	2,366
NOPLAT (capitalizing operating leases)	6,245	4,456	3,033	3,266	2,901	2,489
Invested capital						
Invested capital	37,403	30,689	28,778	21,300	23,422	25,086
Capitalized operating leases	9,141	7,878	8,298	3,034	3,528	3,913
Invested capital (with operating leases)	46,543	38,567	37,075	24,334	26,950	29,000
Return on average capital (percent)						
ROIC (using rental expenses)	17.3	12.1	9.2	14.3	12.5	9.8
ROIC (capitalizing operating leases)	14.5	10.5	8.0	14.0	11.3	8.9

[1] 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 6.

For Home Depot, if we apply the 5.2 percent cost of secured debt (AA-rated debt) current at the time of writing and assume an asset life of 20 years, we can convert $846 million in rental expense to $8.3 billion in operating leases.[17] Exhibit 7.14 presents the resulting adjustment for operating leases for Home Depot and Lowe's. If operating leases are capitalized on the balance sheet, eliminate the interest cost embedded in rental expense from operating profits. In Exhibit 7.14, $486 million in embedded interest is added back to reported EBITA to compute adjusted 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, but making these adjustments typically lowers a company's ROIC. For Home Depot, return on average invested capital drops from 9.2 percent to 8.0 percent upon the capitalization of leases.

The choice of accounting treatment for leases will not affect intrinsic value as long as it is incorporated correctly in free cash flow, the cost of capital,

[17] We use AA-rated debt in May 2009 to estimate lease interest cost because, unlike Home Depot's general obligation debt, leases are typically collateralized by physical assets. Rental expense is not typically disclosed in the financial statements. For Home Depot, rental expense of $846 million is reported in Note 9, Leases, in the company's 2008 annual report.

and debt equivalents. Chapter 27 describes the process for valuing leases in depth, and includes adjustments to free cash flow, cost of capital, and enterprise value.

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) directly on the balance sheet.[18] 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, and pension shortfalls as a debt equivalent (and both should be valued separately from operations).[19] Reporting rules 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. This difference in accounting standards will not affect the treatment of excess pension assets or shortfalls when you are reorganizing the balance sheet, but will affect the valuation. 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. The difference between expected return and interest cost will distort operating profit. Thus, to reflect the true economic expenses of pension benefits given to employees during the current period, remove the accounting pension expense from cost of sales, and replace it with service cost and amortization of prior service costs reported in the notes. For companies that use IFRS, extra care is required. The components of net pension cost can be included in different line items in the income statement (e.g., interest costs as part of interest expenses). Companies typically disclose the amounts for each component and the line on the income statement where the amount is included. Chapter 27 details how to use the pension note to create a clean measure of operating profit. The chapter also discusses how to analyze and value pensions.

[18] 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.

[19] 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 in other liabilities.

Capitalized Research and Development

In line with the conservative principles of accounting, accountants expense research and development (R&D), advertising, and certain other expenses in their entirety in the period they are incurred, even when economic benefits resulting from such expenses continue beyond the current reporting period. For companies that rely significantly on intangible assets, this practice will dramatically understate invested capital and overstate return on capital. If possible, therefore, R&D and other quasi investments should be capitalized and amortized 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 will prevent cuts in R&D from driving short-term improvements in ROIC.

Similar to the choice of accounting treatment for leasing, the choice of whether to capitalize certain expenses will not affect computed value; it will affect only perceptions of value creation. Chapter 28 analyzes the complete valuation process, including adjustments to free cash flow, and final 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, 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:

- *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:* Restructuring charges, such as expected severance during a layoff, 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 and reserves is complex. Chapter 26 provides examples.

REVIEW QUESTIONS

1. Exhibit 7.15 presents the income statement and balance sheet for Companies A, B, and C. Compute each company's return on assets, return on equity, and return on invested capital. Based on the three ratios, which company has the best operating performance?
2. Why does the return on assets differ between Company A and Company B? Why do companies with equity investments tend to have a lower return on assets than companies with only core operations?
3. Why does the return on equity differ between Company A and Company C? Is this difference attributable to operating performance? Does return on assets best reflect operating performance? If not, which ratio does and why?

EXHIBIT 7.15 **Ratio Analysis: Consolidated Financial Statements**

$ million

	Company A	Company B	Company C
Operating profit	100	100	100
Interest	–	–	(20)
Earnings before taxes	100	100	80
Taxes	(25)	(25)	(20)
Net income	75	75	60
Balance sheet			
Inventory	125	125	125
Property and equipment	400	400	400
Equity investments	–	50	–
Total assets	525	575	525
Accounts payable	50	50	50
Debt	–	–	200
Equity	475	525	275
Liabilities and equity	525	575	525

EXHIBIT 7.16 **HealthCo: Income Statement and Balance Sheet**

$ million

Income statement

	Prior year	Current year
Revenues	605	665
Cost of sales	(200)	(210)
Selling costs	(300)	(320)
Depreciation	(40)	(45)
Operating profit	65	90
Interest expense	(5)	(15)
Gain on sale	–	25
Earnings before taxes	60	100
Taxes	(16)	(40)
Net income	44	60

Balance sheet

	Prior year	Current year
Working cash	5	5
Accounts receivable	45	55
Inventories	15	20
Current assets	65	80
Property, plant, and equipment	250	260
Prepaid pension assets	10	50
Total assets	325	390
Accounts payable	10	15
Short-term debt	20	40
Restructuring reserves	20	–
Current liabilities	50	55
Long-term debt	70	70
Shareholders' equity	205	265
Liabilities and equity	325	390

4. Exhibit 7.16 presents the income statement and balance sheet for HealthCo, a $665 million health care company. Compute NOPLAT, average invested capital, and ROIC. Assume an operating tax rate of 25 percent and a marginal tax rate of 35 percent.[20] If the weighted average cost of capital is 9 percent, is the company creating value?
5. Using the reorganized financial statements created in Question 4, what is the free cash flow for HealthCo in the current year?
6. You decide to look closer at HealthCo's current-year tax reconciliation footnote. The table reports $35 million in statutory taxes, a $5 million credit for manufacturing investments, and a one-time tax expense of $10 million related to a past-year audit. Reported taxes are therefore $40 million. What is HealthCo's statutory tax rate, operating tax rate, and effective rate? Why does computing the operating tax rate require judgment?
7. Many companies hold significant amounts of excess cash, that is, cash above the amount required for day-to-day operations. Does including excess cash as part of invested capital distort the ROIC upward or downward? Why?

[20] If you choose to reconcile NOPLAT with net income, nonoperating taxes are $1.5 million and $14.0 million in the prior and current year respectively. This will not match the in-depth tax analysis in Question 6.

8

Analyzing Performance and Competitive Position

Understanding a company's past is essential to forecasting its future. For that reason, a critical component of valuation is the robust analysis of historical performance. Always start with the key drivers of value: 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 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. Is revenue growth driven, for instance, more by organic growth (critical to value creation, as discussed in Chapter 5) or by 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 short- and long-term investments.

The first three sections of this chapter go through the steps involved in analyzing ROIC, revenue growth, and financial health, respectively. The final section of this chapter covers an alternative measure of financial performance: cash flow return on investment (CFROI).

ANALYZING RETURNS ON INVESTED CAPITAL

In Chapter 7, we 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:

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

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. 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.

ROIC is a better analytical tool for understanding the company's performance than return on equity (ROE) or return on assets (ROA) 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 preinterest basis) is an inadequate measure of performance because it not only includes nonoperating assets but also ignores the benefits of accounts payable and other operating liabilities that together reduce the amount of capital required from investors.

Exhibit 8.1 plots ROIC for Home Depot and Lowe's from 2000 to 2008 based on invested capital and NOPLAT calculations (presented in Exhibits 7.5 and 7.10). The ROIC at Home Depot outpaced Lowe's by approximately five percentage points during the early 2000s. This gap disappeared in 2005, when Home Depot began acquiring other companies.[1] Although core operating profit improved in 2005, the premiums paid for acquisitions lowered ROIC. In 2007, the U.S. housing market collapsed, and ROIC fell dramatically for both companies. By 2008, Home Depot's ROIC trailed Lowe's by approximately one percentage point, with both companies earning roughly their cost of capital.

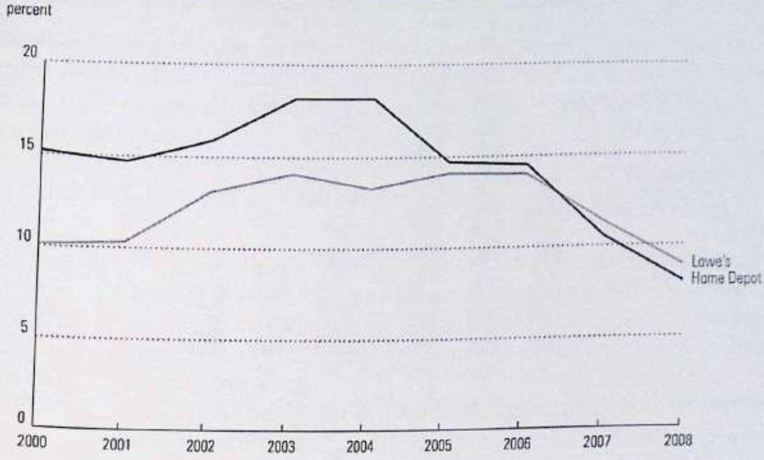
Analyzing ROIC with and without Goodwill and Acquired Intangibles

ROIC should be computed both with and without goodwill and acquired intangibles,[2] because each ratio analyzes different things. For instance, a company

[1] In 2005, Home Depot completed 21 acquisitions, including National Waterworks and Williams Bros. Lumber Company. According to the company's 2005 10-K, the total cash paid for businesses acquired in fiscal 2005 was $2.5 billion.

[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, such as 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 8.1 **Home Depot and Lowe's: Return on Invested Capital**[1]

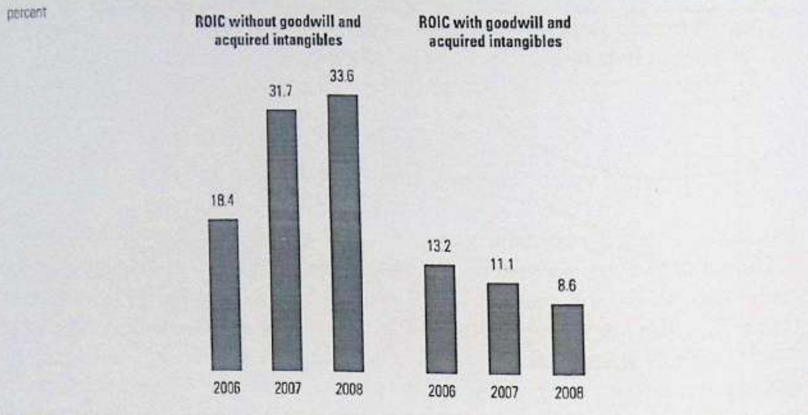


[1] ROIC measured with goodwill and acquired intangibles. Goodwill and acquired intangibles do not meaningfully affect ROIC for either company.

that purchases another at a premium to book must spend real resources to acquire valuable economic assets. If the company does not properly compensate investors for the funds spent (or shares given away), it will destroy value. Thus, when you measure aggregate value creation for the company's shareholders, measure ROIC with goodwill. Conversely, ROIC excluding goodwill measures the underlying operating performance of the company and its businesses and is used to compare performance against peers and to analyze trends. It is not distorted by the price premiums paid for acquisitions.

For both Home Depot and Lowe's, 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 8.2 presents ROIC with and without goodwill for the U.S. pharmacy CVS Caremark and a leading competitor. In 2006, CVS, as it was then known, earned an 18.4 percent ROIC without goodwill, compared with 17.9 percent for its leading competitor. In 2007, CVS purchased Caremark, a pharmaceutical benefits manager (PBM). PBMs have little working capital or fixed assets, so they have high ROICs. Consequently, CVS's aggregate ROIC without goodwill rose to 33.6 percent by 2008, reflecting the addition of a high-ROIC business. This aggregate ROIC cannot be used for benchmarking against peers, however. To understand the company's future value-creating potential, you need to examine the company's performance at the business unit level, because its two major businesses have such different underlying economics.

EXHIBIT 8.2 **CVS Caremark: Return on Invested Capital**



Whereas CVS Caremark's ROIC without goodwill exceeds that of its competitor, the converse is true when ROIC is measured with goodwill. The premiums paid for acquisitions drop CVS Caremark's ROIC from 18.4 percent to 13.2 percent in 2006, below that of its leading competitor. Since the 2007 Caremark acquisition required a premium as well, the combined company's ROIC with goodwill fell to just 8.6 percent by 2008. Does the significant difference in ROIC when measured with and without goodwill imply the acquisition destroys value? It is too early to judge: since cost savings and cross selling opportunities take time to realize, it may take several years for the acquisition's return on capital to exceed its cost of capital.

Analyzing ROIC Using Market versus Book Invested Capital

The traditional measure of ROIC divides NOPLAT by invested capital stated at book value. Thus, ROIC represents the rate of return on capital at its original cost (less depreciation). Although this provides a good ex post measure of financial performance, it should not be used to make entry and exit decisions. Consider a company that built a facility for $1 billion five years ago. The facility is currently generating just $10 million in NOPLAT. Because the facility's 1 percent ROIC is well below its 10 percent cost of capital, the CEO recommends selling the facility. But what if the facility can be sold for only $50 million because the facility has little value to another owner? In this case, the rate of return (based on market-based opportunity costs, not book value) is 20 percent. At $50 million, the CEO would be better off keeping the facility than selling it, assuming current profits can be maintained.

Decomposing ROIC to Build an Integrated Perspective of Company Economics

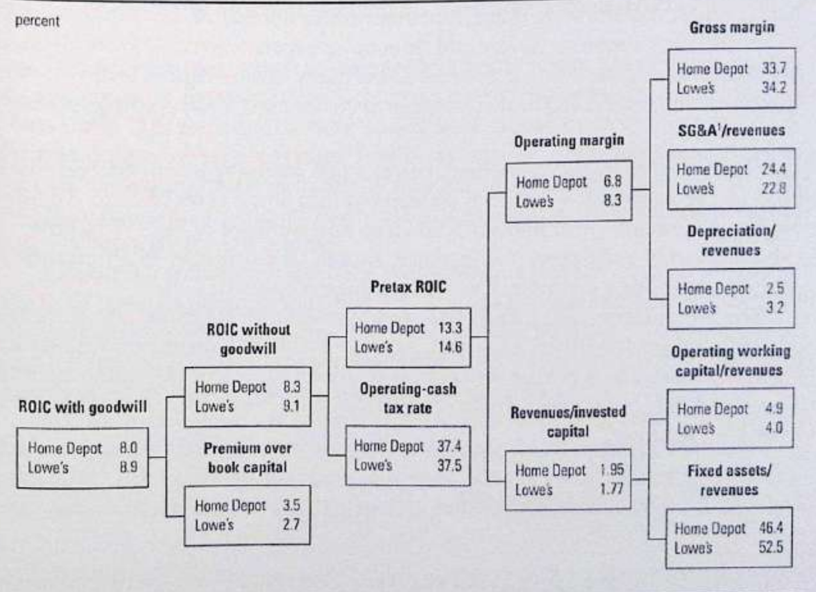
Between 2006 and 2008, ROICs at both Home Depot and Lowe's fell dramatically. But what is causing this drop in performance? To understand which elements of a company's business are driving the company's ROIC, split apart the ratio as follows:

$$\text{ROIC} = (1 - \text{Operating Cash Tax Rate}) \times \frac{\text{EBITA}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Invested Capital}}$$

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 8.3 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. As we read from right to left, each subsequent box is a function

EXHIBIT 8.3 **Home Depot and Lowe's: ROIC Tree, 2008**



[1] Implicit interest expense related to capitalized operating leases has been removed from selling, general, and administrative (SG&A) expense

of the boxes to its right. For example, operating margin equals gross margin less SG&A/revenues less depreciation/revenues, and pretax ROIC equals operating margin times capital turnover. (SG&A refers to selling, general, and administrative expense.)

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 2008 Home Depot's ROIC (8.0 percent) lagged Lowe's ROIC (8.9 percent) by approximately one percentage point. Using the ROIC tree in Exhibit 8.3, we can examine which drivers were responsible for the difference. From a margin perspective, Home Depot's operating margin was 6.8 percent versus 8.3 percent for Lowe's. The lower operating margin is primarily attributable to higher SG&A expense. According to press reports, the rise in SG&A reflects the cost of additional floor personnel to improve the customer experience. Whether this translates to higher sales through better service in the future is a key to the company's valuation.

Analyzing capital efficiency, we see that Home Depot averages 1.95 times revenue to average invested capital, compared with only 1.77 times for Lowe's. For these two companies, capital efficiency derives primarily from the efficiency of fixed assets, which in turn results from more revenues per dollar of store investment. So are Home Depot's stores more efficient or operating at higher-traffic locations? Perhaps, but after further investigation, it appears that a typical Lowe's store is newer and thus more expensive than Home Depot's average store. Newer stores may be a burden today (from a capital turnover perspective) but could lead to an advantage in customer retention going forward.

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 for inventories and payables, to avoid distortion caused by changing prices, as a percentage of cost of goods sold). For operating current assets and liabilities, you can also convert each line item into days, using the following formula:[3]

$$\text{Days} = 365 \times \frac{\text{Balance Sheet Item}}{\text{Revenues}}$$

[3] If the business is seasonal, operating ratios such as inventories should be calculated using quarterly data.

EXHIBIT 8.4 **Home Depot and Lowe's: Operating Current Assets in Days**

Number of days in revenues

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Operating cash	2.5	2.2	2.7	6.2	4.0	5.0
Receivables, net	13.0	5.9	5.0	–	–	–
Merchandise inventories[1]	76.7	83.4	82.4	84.9	88.0	94.4
Other current assets	3.1	3.3	3.6	1.7	2.3	1.6
Operating current assets	95.2	94.7	93.6	92.7	94.3	101.1

[1] Merchandise inventories computed using cost of merchandise sold, rather than revenues.

The use of days lends itself to a simple operational interpretation. As can be seen in Exhibit 8.4, Home Depot's average inventory holding time (using cost of merchandise sold as a base) has risen from 77 to 82 days. For Lowe's, the inventory time is slightly higher, rising from 85 days to 94 days. The increase in inventory holding periods is not surprising, given the sharp decline in revenues for both companies.

Nonfinancial 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.

Consider airlines, which are required for safety reasons to release a tremendous amount of operating data. Exhibit 8.5 details financial and operating data from three U.S. network carriers and three U.S. discount carriers for 2008.[4] Financial data include revenues, fuel costs, salaries, and other operating expenses. Operating data 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 8.6 transforms the data presented in Exhibit 8.5 into a branch on the ROIC tree. Each box in the tree compares the average statistics for the three network carriers versus the three discount carriers. Because of losses at United and JetBlue, both types of carriers have negative operating margins (operating loss divided by total revenues, averaged across three carriers).

For airlines, operating margin is driven by three accounts: aircraft fuel, labor expenses, and other expenses. At first glance, it appears that the three network carriers match the three discount carriers in labor costs. Labor expenses as a percentage of revenues average 23.5 percent for the three network

[4] Network carriers have extensive networks, relying primarily on the hub-and-spoke system. Discount carriers typically fly point to point. In return for a lower price, they fly to fewer locations, use less-traveled airports, and offer fewer services.

EXHIBIT 8.5 **Financial and Operating Statistics across U.S. Airlines, 2008**

$ million

	Network carriers			Discount carriers		
	American	Delta[1]	United	AirTran	JetBlue	Southwest
Revenues	23,766	22,697	20,194	2,552	3,388	11,023
Aircraft fuel and related taxes	9,014	7,346	7,722	1,195	1,352	3,713
Salaries and related costs	6,655	4,802	4,311	475	694	3,340
Other operating expenses	8,773	10,436	9,983	969	1,656	3,521
Operating profit (loss)	(676)	113	(1,822)	(87)	(314)	449
Operating statistics						
Full-time equivalents	84,100	57,706	50,000	7,600	9,895	35,499
Available seat-miles (millions)	163,532	165,639	135,861	23,809	32,442	103,271

[1] Delta numbers adjusted for the acquisition of Northwest Airlines on October 29, 2008.

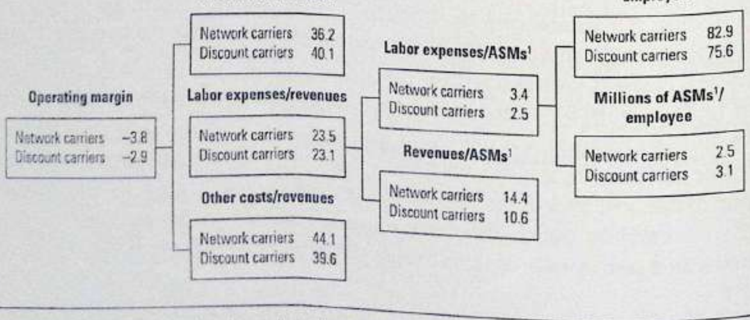
carriers and 23.1 percent for the network carriers. But this statistic is misleading. To see why, disaggregate the ratio of labor expenses to revenue using available seat-miles (ASMs):

$$\frac{\text{Labor Expenses}}{\text{Revenues}} = \left(\frac{\text{Labor Expenses}}{\text{ASMs}}\right) \Big/ \left(\frac{\text{Revenues}}{\text{ASMs}}\right)$$

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 mile, and revenues per ASM represent average price per mile. Although labor expenses to revenues are similar for both carrier types, how they get there differs greatly. The discount carriers have a 38 percent advantage in labor cost per mile (2.5 cents per mile versus 3.4 cents for the

EXHIBIT 8.6 **Operational Drivers of Labor Expenses to Revenues**

percent



[1] Available seat-miles (ASMs) are the standard unit of capacity for the U.S. airline industry. Labor expense and revenue ratios measured in cents per mile.
[2] Labor expenses per employee measured in $ thousands.

network carrier). But what the network carriers lose in labor costs, they recover with higher prices. Because of their locations and reach, network carriers can charge an average price 35 percent higher than the discount carriers (14.4 cents per mile versus 10.6 cents per mile).

But what is driving this differential in labor expenses per ASM? Are the discounter's employees more productive? Or are they paid less? To answer these questions, disaggregate labor expenses to ASMs, using the following equation:

$$\frac{\text{Labor Expenses}}{\text{ASM}} = \left(\frac{\text{Labor Expenses}}{\text{Employees}}\right) \bigg/ \left(\frac{\text{ASMs}}{\text{Employees}}\right)$$

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 8.6 report the calculations for this equation. The average salary is 9 percent higher for the three network carriers, and productivity per mile is 19.2 percent lower. Although the salary differential appears significant, it is quite small compared with earlier in the decade, when average salaries differed by a factor of almost two.

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 network and discount carriers be explained by the mix of employees (pilots are more expensive than gate personnel), the location of the employees (New York is more expensive than Texas), or poor contract negotiations? Each of these analyses will provide additional insight into the each carrier type's ability to survive and prosper.

ANALYZING REVENUE GROWTH

In Chapter 2, we 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. And 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. The three prime culprits distorting revenue growth are the effects of changes in currency values, mergers and acquisitions, and changes in accounting policies. Strip out from revenues any distortions created by these effects in order to base forecast revenues for valuation on sustainable precedents.

EXHIBIT 8.7 **Compass and Sodexo: Revenue Growth Analysis**

percent

	Compass			Sodexo		
	2006	2007	2008	2006	2007	2008
Organic revenue growth	7.0	5.0	5.9	6.4	8.4	7.7
Currency effects	1.0	(5.1)	5.1	2.8	(3.7)	(6.7)
Portfolio changes	(22.9)	(5.0)	0.4	0.4	(0.1)	0.7
Reported revenue growth	(14.9)	(5.1)	11.4	9.6	4.6	1.7

Exhibit 8.7 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, schools, and sporting venues. In 2008, total revenues at Compass grew by 11.4 percent, and revenues at Sodexo grew by 1.7 percent. The difference in growth rates appears dramatic but is driven primarily by changes in currency values (pounds sterling versus euros), not by organic revenue growth. Stripping out currency effects, acquisitions, and divestitures, organic revenue growth at Sodexo (7.7 percent) actually outpaced that of Compass (5.9 percent) by nearly two percentage points.

Given recent swings in currency values and large portfolio changes effected through restructurings by many companies, historical revenue growth for large multinationals can be extremely volatile, making benchmarking difficult. For Compass, revenue growth varied between negative 14.9 percent in 2006 and positive 11.4 percent in 2008. Sodexo exhibited similar volatility. In contrast, organic growth is more stable. Compass's organic revenue growth averaged 6.0 percent, and Sodexho's averaged 7.6 percent over the same period, but neither varied more than one percentage point from their average value.

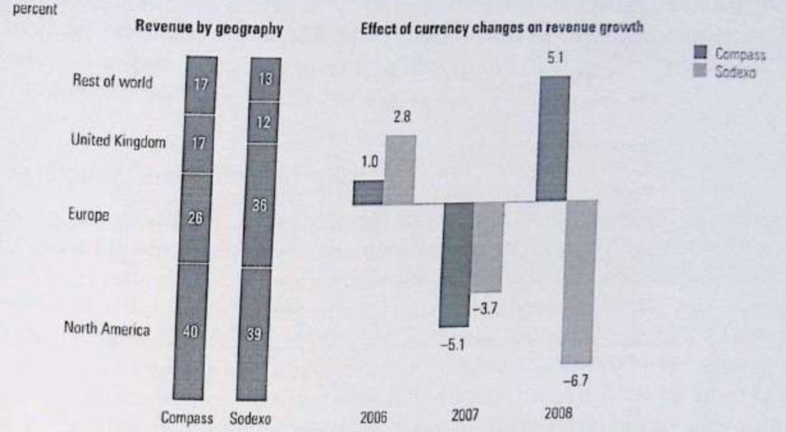
In the next three sections, we examine drivers of revenue growth and iscuss their effect on performance measurement, forecasting, and ultimately luation.

rency Effects

inational companies conduct business in many currencies. At the end of reporting period, these revenues are converted to the currency of the ting company. If foreign currencies are rising in value relative to the ny's home currency, this translation, at better rates, will lead to higher e numbers. Thus, a rise in revenue may not reflect increased pricing or greater quantities sold, but simply depreciation in th ny's irrency.

bit 8.8 reports revenue by geography for Co panies have similar geographic mixes, with

EXHIBIT 8.8 **Compass and Sodexo: Effect of Currencies on Revenue Growth**



revenues coming from North America. Since each company translates U.S. dollars into a different currency, exchange rates will affect each company quite differently.

Compass translates U.S. dollars from its North American business into British pounds. Given the weakening of the pound against the U.S. dollar ($2.04 per pound in 2007 versus $1.78 per pound in 2008), Compass reported an increase in revenues of 5.1 percent attributable to the weakening pound. For Sodexo, exchange rates had the opposite effect. As the euro strengthened against the dollar, Sodexho translated revenue from North America into fewer euros, leading to a 6.7 percent drop in euro-denominated revenue.

The right side of Exhibit 8.8 demonstrates the dramatic effects of volatility in exchange rates. Movements that hurt Compass in 2007 reversed themselves in 2008. Failing to acknowledge these currency movements can lead to a critical misunderstanding of a global company's ability to grow organically.

Mergers and Acquisitions

Growth through acquisition may have very different effects on ROIC from internal growth 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 acquisition or internally.

Stripping the effect of acquisitions from reported revenues is 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

EXHIBIT 8.9 **Effect of Acquisitions on Revenue Growth**

$ million

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue by company					
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 (percent)					
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.

financials as though the acquisition were completed at the beginning of the fiscal year. 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 year to year, reconstructed prior years also must include only partial-year revenue.

Exhibit 8.9 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. Consolidated revenues, however, spike during the two years surrounding the acquisition. Whereas the individual companies are growing at 10 percent each and every 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 ($7/12 \times \$22$ 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, compare year 3 revenues ($135.1 million) to adjusted year 2 revenues ($122.8 million). The resulting organic revenue growth rate equals 10 percent, which matches the underlying organic revenue growth of the individual companies.

[5] For example, Cablevision Systems purchased *Newsday* in July 2008. Consolidated revenue for Cablevision Systems in 2008 includes revenue generated by *Newsday*, but only subsequent to July 29, 2008. Since 2008 includes five months of *Newsday* revenue and 2007 does not, the company's consolidated revenue cannot be compared with the prior year's revenue without adjustment.

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, year 3 revenue must also contain a full year of target revenue. Consequently, year 3 should be increased by five months of target revenue ($5/12 \times \$24.2$ 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. Most changes in revenue recognition policies do not come as formal pronouncements from the boards themselves, but from task forces that issue topic notes. Companies then have a set amount of time to implement the required changes. 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 Emerging Issues Task Force (EITF) 09-3 from the FASB, which changes the way revenue is recognized for companies that package computer hardware and software. Before 2010, companies were required to follow Statement of Position (SOP) 97-2, which states that revenue should be recognized using "contract accounting." For example, Apple recognizes the revenue from the sale of an iPhone over 24 months because the company provides free software upgrades for two years. Under EITF 09-3, companies will be able to recognize hardware revenue and profit at the point of sale. When Apple adjusts to the new rule, it will recognize the majority of iPhone revenue immediately versus gradually over two years. This will cause an artificial rise in Apple's revenue during the year of the accounting change.

If an accounting change is material, a company will document the change in its section on management discussion and analysis (MD&A). The company will also recast its historical financial statements. Some companies do not fully document changes in accounting policy, and this can lead to distorted views of performance.

Decomposing Revenue Growth to Build an Integrated Perspective of Company Economics

Once the effects of mergers and acquisitions, currency translations, and accounting changes have been removed from the year-to-year revenue growth

[6] Revenue recognition changes can also affect margins and capital turnover ratios. They will not, however, affect free cash flow.

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 norms of the industry and the practices of competitors. 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, we can build a deeper understanding of the business. Consider this retailing standard:

$$\text{Revenues} = \frac{\text{Revenues}}{\text{Stores}} \times \text{Stores}$$

Using the operating statistics reported in Exhibit 8.10, we discover that Home Depot not only has more stores than Lowe's, but also generates more revenue per store ($31.1 million per store for Home Depot versus $29.2 million for Lowe's). Using the three operating statistics, we can 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 are changing over time. Exhibit 8.11 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. At Home Depot, store-based revenues declined by 7.9 percent in 2008, while Lowe's held revenues flat in the same year. How did Lowe's avoid the growth problems of Home Depot? Actually, it did not. Lowe's kept aggregate revenues flat by opening 115 stores,

EXHIBIT 8.10 **Home Depot and Lowe's: Operating Data**

	Home Depot			Lowe's		
	2006	2007	2008	2006	2007	2008
Store revenues[1] ($ million)	78,337	76,793	70,736	46,906	48,276	48,211
Number of stores	2,147	2,234	2,274	1,385	1,534	1,649
Number of transactions (million)	1,330	1,336	1,272	680	720	740
Square footage at fiscal year-end (million)	224	235	238	157	174	187

[1] Store revenues are revenues generated by customer transactions. They do not include other revenues.

32

Valuing Flexibility

In valuing companies with the standard discounted cash flow (DCF) approaches outlined in Part Two, we did not consider the value of managerial flexibility. Managers react to changes in the economic environment by adjusting their plans and strategies. For example, they may choose to scale back or abandon an investment project that delivers poor results, or to expand or extend the project if it is highly successful. Such flexible changes of plan can take many different forms, and each may have a substantial impact on value. A standard DCF approach based on a single cash flow projection, or even multiple cash flow scenarios, cannot calculate what that impact is.

Managerial flexibility is not the same as uncertainty. Companies or projects with highly uncertain futures involving a single management decision, such as business start-ups with high growth potential, can indeed be valued using a standard DCF approach under different scenarios (see, for example, Chapter 34). Flexibility refers to choices between alternative plans that managers may make in response to events. For example, if they have planned to stage their investments in the business start-up, they may decide whether to proceed or not at each stage, depending on information arising from the stage before. For cases where managers expect to respond flexibly to events, we need a special, contingent valuation approach.

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 responses to specific events 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.[1] 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 so on. In this chapter, we concentrate on how to value flexibility when valuing projects.

We explore two contingent valuation approaches: real-option valuation (ROV), based on formal option-pricing models, and decision tree analysis (DTA). Although they differ on some technical points, both boil down to forecasting, implicitly or explicitly, the future free cash flows contingent on the future states of the world and management decisions, and then discounting these to today's value.

You should learn both the ROV and the DTA approaches, because each has advantages depending on the types of risks involved. Valuing flexibility does not always require sophisticated, formal option-pricing models. The DTA approach is an effective alternative for valuing flexibility related to, for example, technological risk but not commodity risk. Furthermore, if you have no reliable estimates on the value and variance of the cash flows underlying the investment decision, there is little justification for using sophisticated ROV approaches. In addition, the DTA approach is more transparent to managers than is ROV, which most managers cannot easily decipher.

Real-option valuation is theoretically superior to DTA, 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. Because commodity prices are observable, the ROV approach is especially well suited to decisions in commodity-based businesses, such as investments in oil and gas fields, refining facilities, chemical plants, and power generators.[2]

This chapter is limited to the basic concepts of valuing managerial flexibility and real options. We focus on the following topics:

- Fundamental concepts behind uncertainty, flexibility, and value (when and why flexibility has value)

[1] 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.

[2] 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).

- Classification of flexibility in terms of real options to defer investments; make follow-on investments; and expand, change, or abandon production
- Comparison of DTA and ROV approaches to valuing flexibility, including situations when 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, so 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:

$$\text{NPV} = \frac{-6{,}000}{1.05} + \sum_{t=1}^{\infty} \frac{300}{(1.05)^t} = 286$$

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.

[3] The example is inspired by A. Dixit and R. Pindyck, *Investment under Uncertainty* (Princeton, NJ: Princeton University Press, 1994), 26.

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 13, we can rewrite the previous NPV calculation in terms of the probability-weighted values of the drug, discounted to today:

$$\begin{aligned} \text{NPV} &= 0.5\left[\frac{-6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{500}{(1.05)^t}\right]+0.5\left[\frac{-6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{100}{(1.05)^t}\right] \\ &= 0.5(4{,}286)+0.5(-3{,}714)=286 \end{aligned}$$

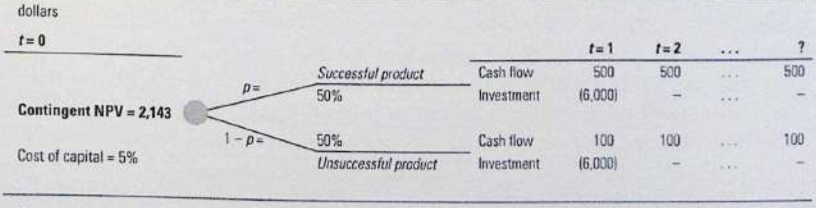
Here, the NPV is shown as the weighted average of two distinct results: a positive NPV of $4,286 following a favorable trial outcome and a negative NPV of –$3,714 for an unfavorable outcome. If the decision to invest can be deferred until trial results are known, the project becomes much more attractive. 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, we can use a contingent NPV approach, working from right to left in the payoff tree shown in Exhibit 32.1:

$$\begin{aligned} \text{NPV} &= 0.5\times\text{Max}\left[\left(\frac{-6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{500}{(1.05)^t}\right),0\right]+0.5 \\ &\quad\times\text{Max}\left[\left(\frac{-6{,}000}{1.05}+\sum_{t=1}^{\infty}\frac{100}{(1.05)^t}\right),0\right] \\ &= 0.5(4{,}286)+0.5(0)=2{,}143 \end{aligned}$$

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

EXHIBIT 32.1 **Value of Flexibility to Defer Investment**



Note: t = time, in years
p = probability

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.

Based on this example, we can 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:

$$\text{Standard NPV} = \underset{t=0}{\text{Max}}\left[\frac{\text{Expected (Cash Flows)}}{\text{Cost of Capital}}, 0\right]$$

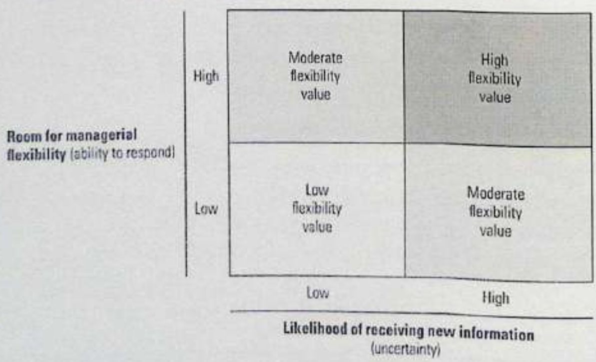
The contingent NPV is the expected value of the maximums, decided when information arrives, of the discounted cash flows in each future state or zero:

$$\text{Contingent NPV} = \text{Expected}_{t=0}\left[\text{Max}\left(\frac{\text{Cash Flows Contingent on Information}}{\text{Cost of Capital}}, 0\right)\right]$$

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 32.2). 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

EXHIBIT 32.2 **When Is Flexibility Valuable?**



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 strategic reasons. In these cases, the flexibility recognized in contingent valuation fits better with strategic intuition than the rigid assumptions of standard NPV approaches.

Drivers of 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:

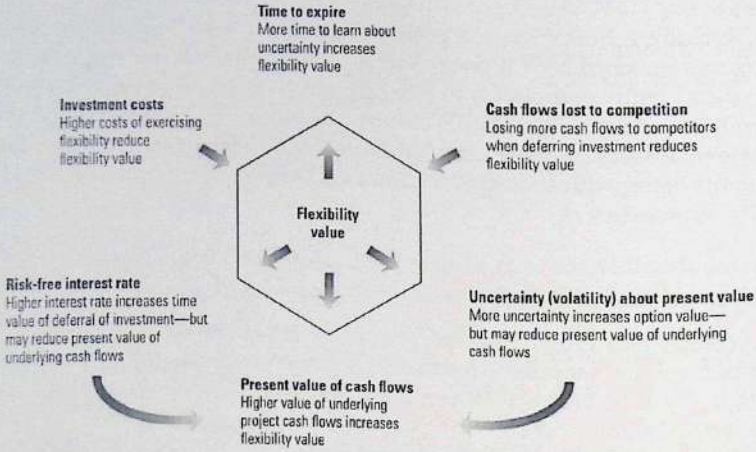
$$\begin{aligned}\text{NPV} &= 0.5 \times \text{Max}\left[\left(\frac{-6{,}000}{1.05} + \sum_{t=1}^{\infty} \frac{600}{(1.05)^t}\right), 0\right] + 0.5 \\ &\quad \times \text{Max}\left[\left(\frac{-6{,}000}{1.05} + \sum_{t=1}^{\infty} \frac{0}{(1.05)^t}\right), 0\right] \\ &= 0.5(6{,}286) + 0.5(0) = 3{,}143\end{aligned}$$

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 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

[4] We assume that the trial outcome risk is uncorrelated with the overall economy.

EXHIBIT 32.3 **Drivers of Flexibility Value**



$400 across outcomes.[5] As with financial options, the value of a real option depends on six parameters, summarized in Exhibit 32.3.

These drivers of 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.

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 32.3 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 flow without changing its 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.

[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.

Higher interest rates reduce the present value of 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.

CLASSIFYING FLEXIBILITY IN TERMS OF REAL OPTIONS

Contingent valuation is an important tool for helping managers make the right decisions to maximize shareholder value when faced with strategic or operating flexibility. However, in real life, that flexibility is never as well defined and straightforward as in the preceding examples. A lot 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 key 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.
- *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

[6] For a more in-depth discussion, see, for example, Copeland and Antikarov, *Real Options*; or Trigeorgis, *Real Options*.

them to make 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 structured into a project to create maximum value. Think of redesigning infrastructure investments in ports or airfields in stages such that future expansion takes place only if and when needed, or 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 does not have any value if managers do not act on the information, as is sometimes the case, "because we have made such enormous investments already." When 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 next.

Option to Defer Investment

The option to defer an investment is equivalent to a call option on stock. For example, assume a leaseholder of an undeveloped oil reserve has the right to develop the reserve by paying a lease-on-development cost. The leaseholder can defer development until oil prices rise. The expected development cost is equivalent to the exercise price.

Deferring investment is not without cost. The opportunity cost of deferring investment equals the difference between the current net proceeds per barrel of oil produced and the present value per barrel of developed oil reserves. If this opportunity cost is too high, the decision maker may want to exercise the option (e.g., develop the reserve) before its relinquishment date.

Abandonment Option

The option to abandon (or sell) a project, such as the right to abandon a coal mine, is equivalent to a put option on a stock. If a project proceeds poorly, the decision maker may abandon the project and collect the liquidation value. The expected liquidation (or resale) value of the project is equivalent to the exercise price. When the present value of the asset falls below the liquidation value, the act of abandoning (or selling) the project is equivalent to exercising a put. Because the liquidation value of the project sets a lower bound on the project's value, the option to liquidate is valuable. A project that can be liquidated is worth more than a similar project without the possibility of abandonment.

Follow-On (Compound) Option

Technically speaking, follow-on options are options on options (so-called compound options). An example would be phased investments, such as a factory that can be built in stages, each stage contingent on those that precede it. At each decision point, management can continue the project by investing additional funds (an exercise price) or abandon it for whatever it can fetch. Other examples are research and development programs, new-product launches, exploration and development of oil and gas fields, movie sequels, and an acquisition program where the first purchase is thought of as a platform for later acquisitions.

Option to Expand or Contract

The option to expand the scale of a project is equivalent to a call option on stock. For example, management may choose to build production facilities in such a way that they can be easily expanded if a product is more successful than was anticipated. An option to expand gives management the ability, but not the obligation, to make additional follow-on investments (e.g., to increase the production rate) if the project proceeds well. The option to contract the scale of a project's operation is conceptually equivalent to a put option. Projects should be engineered so that output can be contracted if necessary. The ability to forgo future spending on the project is equivalent to the exercise price of the put.

Option to Extend or Shorten

Companies that can extend the life of an asset or contract by paying a fixed amount of money (the exercise price) own a valuable option. This is also true if it is possible to shorten the life of an asset or a contract. The option to extend is a call option, and the option to shorten is a put option. Real estate leases often have clauses with an option to extend or shorten the lease.

Option to Increase or Decrease Scope

Scope is the number of activities covered in a project. An option related to scope is the ability to increase or decrease activities at a future decision point. Scope is like diversification: it is sometimes preferable to be able, at some exercise cost, to choose among a wider range of alternatives. An option to increase scope is similar to a call.

Switching Options

A project whose operation can be switched on and off (or switched between two distinct locations, and so on) is worth more than a similar project without this flexibility. Examples include a flexible manufacturing system that can produce two or more different products, peak-load power generation, and the ability to exit and reenter an industry. The option to switch project locations or choose among raw materials is a portfolio of call and put options. Restarting operations when a project is shut down is equivalent to a call option. Shutting down operations when unfavorable conditions arise is equivalent to a put option. The cost of restarting (or shutting down) operations may be thought of as the exercise price.

METHODS FOR VALUING FLEXIBILITY

As we 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:

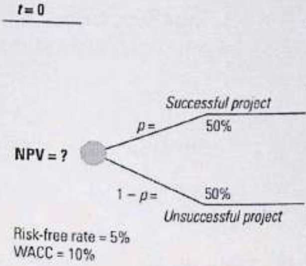
$$\text{PV} = \frac{0.5(150) + 0.5(50)}{1.10} = 90.9$$

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 32.4 **Contingent Payoffs for Investment Project, Twin Security, and Risk-Free Bond**

dollars



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**

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 32.4). 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. We first value this flexibility using an ROV approach.

Real-Option Valuation (ROV)

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 90.9 (= 3 × 30.3). 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 of the world. 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. The probability-weighted average cash flow is then discounted 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:

$$p^* = 0.45$$
$$1 - p^* = 0.55$$

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 (DTA)

A second method for valuing a project with flexibility is to use decision tree analysis (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 more risky. 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

[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.

45 percent (to \$50). If we were to use the underlying asset's cost of capital of 10 percent, 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:

$$\text{Contingent NPV} = 0.5\left[\frac{150}{1.10} - \frac{105}{1.05}\right] + 0.5(0) = 18.2 \qquad (32.1)$$

We discuss in the next section how this second DTA approach can lead to the exact ROV outcome if the underlying risk is either diversifiable or nondiversifiable but too small to influence the future investment decision (i.e., if the project value would exceed the investment requirements even in the unfavorable state).

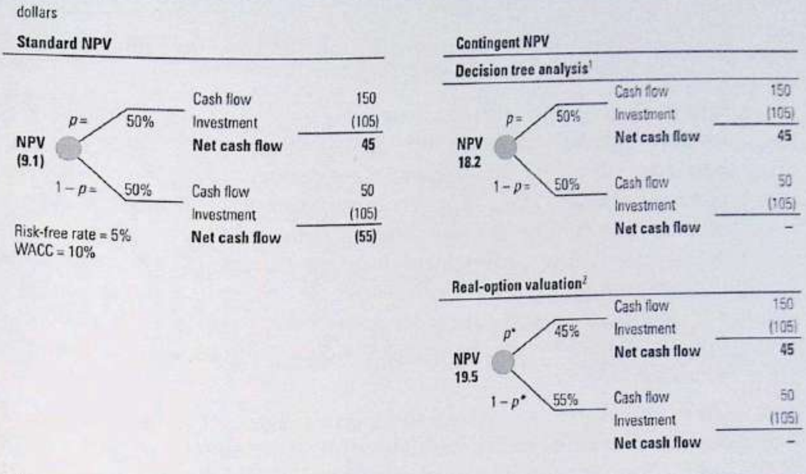
Comparing ROV and DTA Approaches

As summarized in Exhibit 32.5, the standard NPV approach undervalues our mining project. The ROV approach generates a correct value 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 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 single 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 32.6 describes 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.

Underlying risk: Diversifiable versus 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

EXHIBIT 32.5 **Valuation Result: Standard versus Contingent NPV**

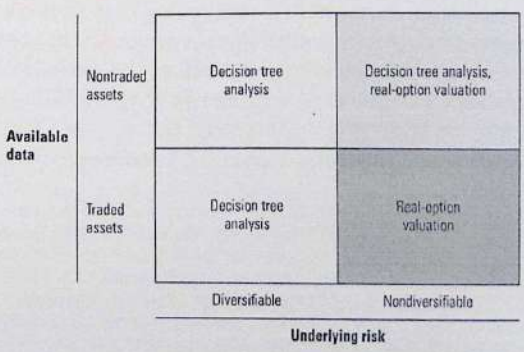


Note: t = time, in years; p = probability; p^* = binomial (risk-neutral) probability.
[1] Discounting cash flows at the project's cost of capital of 10% and investments at the risk-free rate of 5%.
[2] Using risk-neutral valuation.

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, are keys to future investment decisions, the key *underlying risk is not diversifiable*. Other examples include interest or currency risks or risks

EXHIBIT 32.6 **Application Opportunities for ROV versus DTA**



that are strongly correlated with overall economic activity. For some investments, these 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 in fuel and power prices and by overall demand for power.

- If technological risks such as a drug trial outcome are key, the *underlying risk is diversifiable* because the correlation of the outcome with overall economic activity is low. Other examples are geological risks such as the size of an undeveloped oil field, or even some forms of marketing risk such as consumer acceptance of a new product. 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.

When nondiversifiable risk is driving future investment decisions, only ROV leads to the theoretically correct valuation. The DTA approach might end up close but is difficult to apply because it is unclear how to discount the project's contingent cash flows (unless you know the implied cost of capital from the ROV results). This was illustrated in the second example in this chapter, where the difference in mining payoffs stemmed from changes in the mineral price. The ROV approach—using the mineral commodity to set up a replicating portfolio—provided the correct estimate of the project's value. The DTA approach could not provide a correct value, although it was quite close in that particular case.

For diversifiable underlying risk, a straightforward DTA is an effective tool for valuing flexibility. In this case, we can 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 the example in equation 32.1). A simple illustration is the pharmaceutical drug example from the beginning of the chapter. There was an implicit assumption that all the underlying risks in the development project were diversifiable, given that the cost of capital was equal to the risk-free rate. Therefore, we could use a simple DTA approach and still arrive at exactly the same (correct) value that an ROV approach would have produced.[11]

[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.

In reality, investment risks are rarely completely diversifiable. A developed drug's cost of capital typically exceeds the risk-free rate because demand and price for a drug are likely to vary at least somewhat with economic conditions. The key question is then whether the contingent investment decisions are driven by the diversifiable risk (e.g., the outcome of clinical trials) or the nondiversifiable risk in a project (e.g., as reflected in the beta of a successfully developed drug). We can effectively apply the DTA approach as long as the contingent decisions are predominantly driven by diversifiable underlying risk: discount the project's payoffs at the weighted average cost of capital and the investment layouts at the risk-free rate.

Toward the end of this chapter, we include a numerical example of a research and development project where the DTA approach leads to exactly the same value as an ROV approach because the nondiversifiable risk does not make a difference in the future investment decisions.

Data availability: Traded versus untraded assets The results of an ROV (and DTA) valuation 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 misestimate the future cash flows generated by a highly effective drug, the value of the option to defer will be inaccurate. In this simple example, we assumed a no-growth cash flow perpetuity. 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,[12] meaning the decision of whether to undertake the project is a close call.[13]

To illustrate the impact of volatility on such options, consider the value of a 10-year, at-the-money call option on a dividend-paying stock. Assume the risk-free rate is 5 percent, the dividend yield is 2.5 percent, and the current price for the underlying stock is $100. The value of the call option would be $27 based on a volatility of 20 percent and $35 for a volatility of 30 percent—an increase in value of almost 30 percent.[14] Likewise, in the drug development example,

[12] 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.

[13] 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.

[14] The results were obtained with a Black-Scholes option-pricing model. See, for example, R. Brealey and S. Myers, *Principles of Corporate Finance*, 7th ed. (New York: McGraw-Hill, 2003), chap. 21.

changes in cash flow variance significantly affect the option's value. 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?[15]

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. Even then, accurately estimating underlying value and variance is not straightforward. Although short-term volatility can be measured using commodity prices, it is often the long-term volatility that is important for real options (because they have long lifetimes). In fact, short-term volatility can be misleading because oil prices are mean-reverting. For example, high current volatility of spot prices for crude oil is not meaningful for the valuation of a long-term, oil-related option. Extrapolating high short-term volatility could suggest long-term future oil prices that are unrealistically high or low.

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 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-STEP PROCESS FOR VALUING FLEXIBILITY

To value flexibility, use the four-step process illustrated in Exhibit 32.7. 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 and 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.

[15] The range needs to include the associated probabilities to provide a variance estimate.

EXHIBIT 32.7 **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

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 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

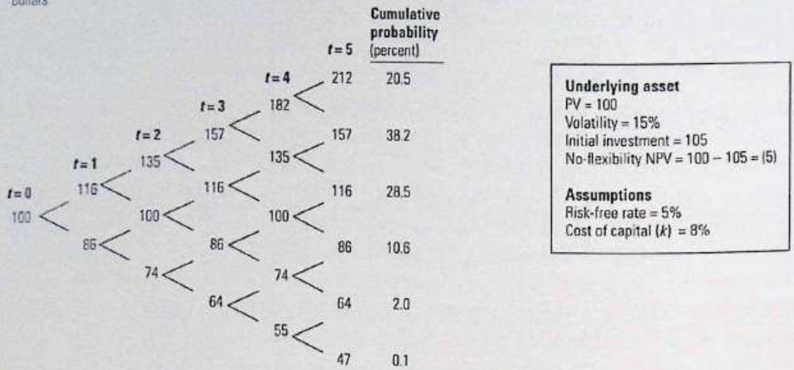
Using the four-step process, we illustrate the ROV approach with a straightforward binomial lattice for valuing flexibility that is assumed to be driven by nondiversifiable risk. The results are identical to alternative option-pricing models that use more complicated mathematics such as stochastic calculus 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.[16] Its expected rate of return and cost of capital (k) equals 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.

[16] The standard deviation of the rate of change of the factory value.

EXHIBIT 32.8 **Event Tree: Factory without Flexibility**

dollars



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 32.8 illustrates potential values the factory might take for each of next five years. Defining T as the number of years per upward movement and σ as the annualized volatility of the underlying factory value, determine the up-and-down movements by using the following formulas:[17]

$$\text{Up Movement} = u = e^{\sigma\sqrt{T}}$$

$$\text{Down Movement} = d = \frac{1}{u}$$

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

[17] 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.

27.18 percent.[18] 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:

$$\mathrm{PV}_{t=4} = \frac{E(\mathrm{PV}_{t=5})}{(1+k)} = \frac{0.7282(211.7) + 0.2718(156.8)}{1.08} = 182.2$$

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 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 32.9 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 211.7, but with expansion, it is $1.20 \times 211.7 - 15 = 239.0$. Since the value with expansion is higher, we would decide to expand. On the lower limb of that same node, the payout with expansion is $1.20 \times 156.8 - 15 = 173.2$, versus 156.8 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 32.9, you can replicate the payoffs from the option to expand, using a portfolio of N units of the underlying project[19] and B units of \$1 risk-free bonds:

$$116.2N + 1.05B = 124.4$$

$$86.1N + 1.05B = 88.3$$

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

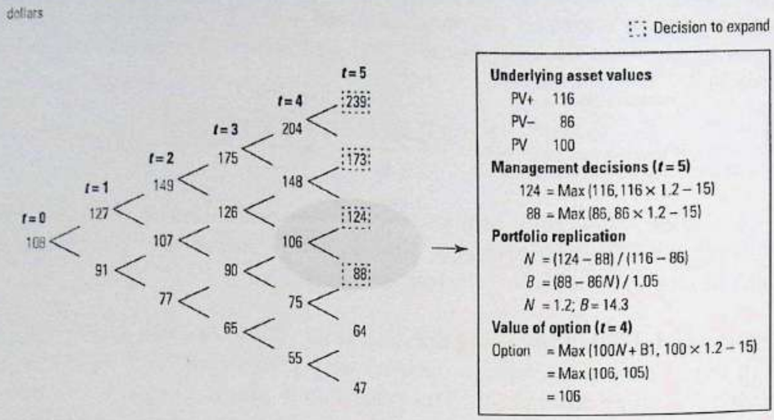
[18] See the previous note for the derivation of the formula for estimating the upward probability:

$$\frac{(1+k)^T - d}{u - d} = \frac{(1 + 8\%) - 0.8607}{1.1618 - 0.8607} = 0.7282$$

[19] If the project itself is not traded but a traded twin security exists, we could construct the portfolio in a similar way with units of the twin security and risk-free bonds.

EXHIBIT 32.9 **Decision Tree: Option to Expand Factory**

dollars



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%

(at that node, valued at $100 in Exhibit 32.8), plus a short position of 14.3 bonds worth $1. As shown in Exhibit 32.9, the value of the option is then:

$$\text{PV} = 100N + 1B = 105.7$$

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 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.[20]

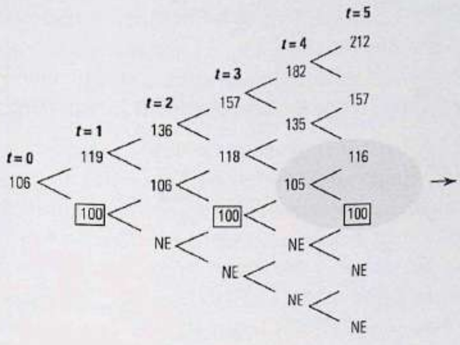
If, instead, management had the option to abandon the factory at any node for a fixed liquidation value of $100, the valuation would be as shown in Exhibit 32.10. Again, work from right to left through the decision tree. For the highlighted node, the value of the underlying factory is $116.20 in the upward branch and $86.10 in the downward branch. Given the ability to do so, the company would abandon the project for $100 in the downward branch, so the

[20] 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 32.10, 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 32.10 **Decision Tree: Option to Abandon Factory**

dollars

☐ Decision to abandon



Underlying asset values
PV+ 116
PV− 86
PV 100
Management decisions (t = 5)
116 = Max (116, 100)
100 = Max (86, 100)
Risk-neutral valuation
$p^* = (1 + r_f - d) / (u - d)$
$= (1.05 - 0.861) / (1.162 - 0.861)$
$= 0.629$
Value of option (t = 4)
Option $= \text{Max}\,([p^* \times 116 + (1 - p^*)\,100] / 1.05, 100)$
$= \text{Max}\,(105, 100)$
$= 105$

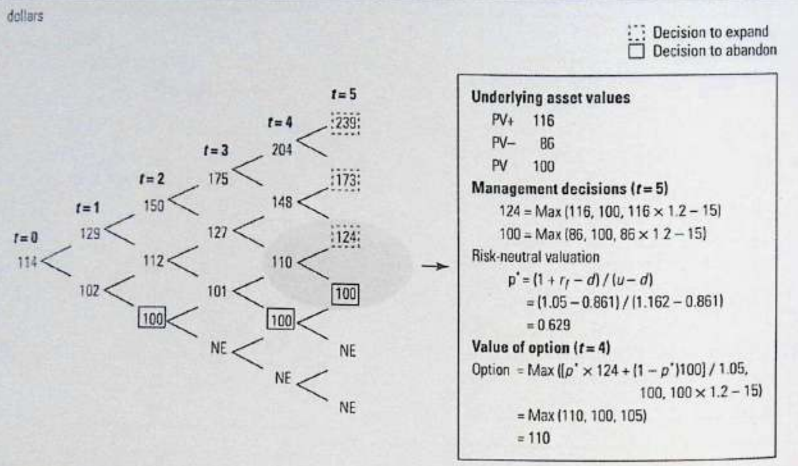
Note: NE = nonexisting state
t = time, in years
PV = present value
p^* = binomial (risk-neutral) probability
u = upward movement of value
d = downward movement of value
r_f = risk-free rate
Liquidation value: $100

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 32.10 (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 32.11, 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 32.11, 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.

EXHIBIT 32.11 **Decision Tree: Option to Expand or Abandon Factory**

dollars



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%

REAL-OPTION VALUATION AND DECISION TREE ANALYSIS: A NUMERICAL EXAMPLE

In our next example, we apply 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,[21] 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.

[21] 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."

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 drugs are protected against competition through patents. A successful drug is expected to generate annual sales of $2,925 million and a 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 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:

$$\text{Standard NPV} = \text{PV(Expected Cash Flows)} - \text{PV (Investments)}$$

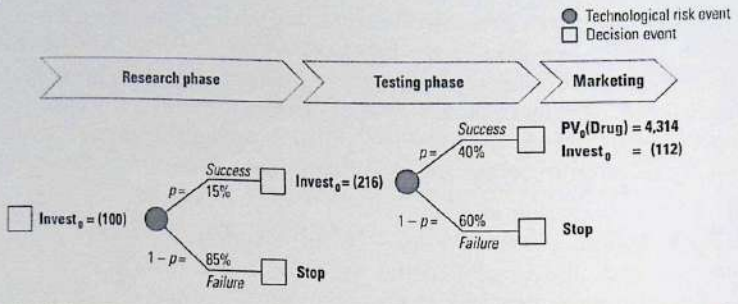
$$= 0.06\frac{6,475}{(1.07)^6} - 100 - \frac{250}{(1.05)^3} - \frac{150}{(1.05)^6} = -169$$

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 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 32.12). 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

EXHIBIT 32.12 **Event Tree: R&D Option with Technological Risk**

$ million



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

launch of $6,475 discounted over six years at 7 percent). Since the investment outlays are certain, they are discounted at the risk-free rate of 5 percent.[22]

Step 3: Model flexibility using 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).

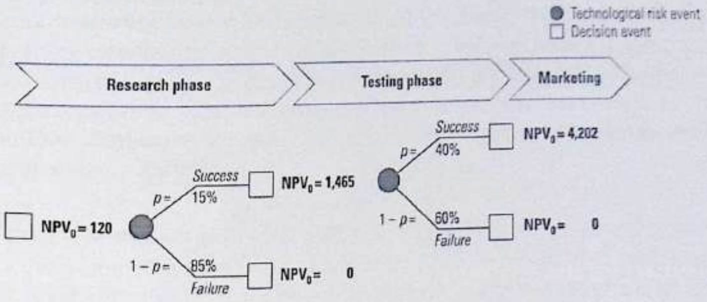
Step 4: Estimate value of flexibility Because the technological risk is fully diversifiable, apply a DTA approach for the valuation of flexibility. Again, work from right to left in the tree (see Exhibit 32.13). At the end of the testing phase, we proceed with launching the product only if there is a marketable product. The value at this point in time is therefore Max[(4,314 − 112), 0] = $4,202 million. The value of the option to proceed at the end of the research phase is calculated as follows:

$$\text{PV (Option)} = \text{Max[PV (Testing)} - \text{Inv (Testing)},\ 0]$$

[22] The assumption to discount investment outlays at the risk-free rate is also implicitly made in the ROV approach.

EXHIBIT 32.13 **Decision Tree: R&D Option with Technological Risk**

$ million



Note: NPV_t = net present value of development project discounted to $t = 0$
p = probability of technological success

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 equals \$250 million or \$216 million 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:

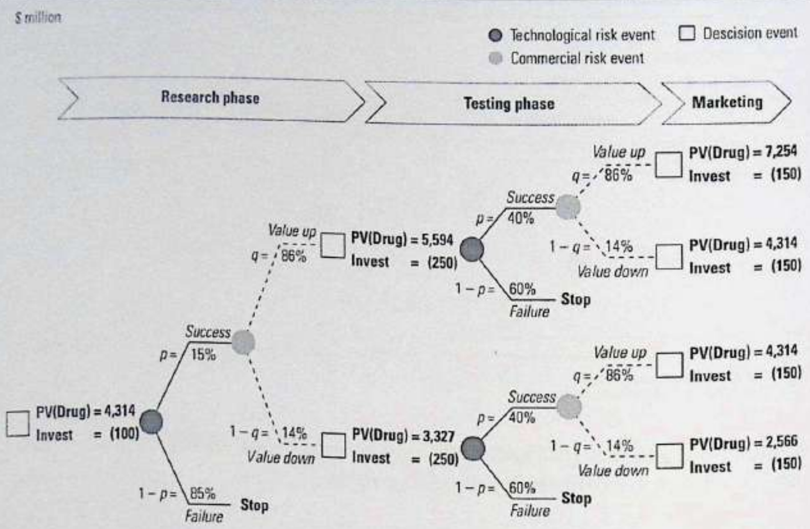
$$\begin{aligned}\text{PV (Option)} &= \text{Max [PV (Research)} - \text{Inv (Research)}, 0]\\ &= \text{Max}\,[0.15\,(1{,}465) + 0.85\,(0) - 100,\ 0] = \$120 \text{ million}\end{aligned}$$

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.

EXHIBIT 32.14 **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

Step 1: Estimate present value without flexibility This step is identical for the DTA and ROV approaches.

Step 2: Model uncertainty using event tree Both risks can be modeled in a combined event tree (see Exhibit 32.14). 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.[23] Assuming an annual volatility of 15 percent, we can derive the upward and downward movements, u and d, as follows:

$$u = e^{\sigma\sqrt{T}} = e^{0.15\sqrt{3}} = 1.30$$

$$d = \frac{1}{u} = \frac{1}{1.30} = 0.77$$

[23] 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.

The probability of an upward movement is 86 percent, and the probability of a downward movement is 14 percent.[24] 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: failure leading to a drug value of $0, success combined with an increase in the value of a marketable drug to $5,594 million, and success combined with a decrease in the value of a marketable drug to $3,327 million. Following the same logic, there are six possible outcomes after the testing phase.

Step 3: Model flexibility using decision tree The logic underlying the decision tree including commercial risk (see Exhibit 32.15) 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,[25] so you need to use an ROV approach to 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 32.15, 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:

$$\text{PV (Option)} = \text{Max [PV (Testing)} - \text{Inv (Testing), 0]}$$

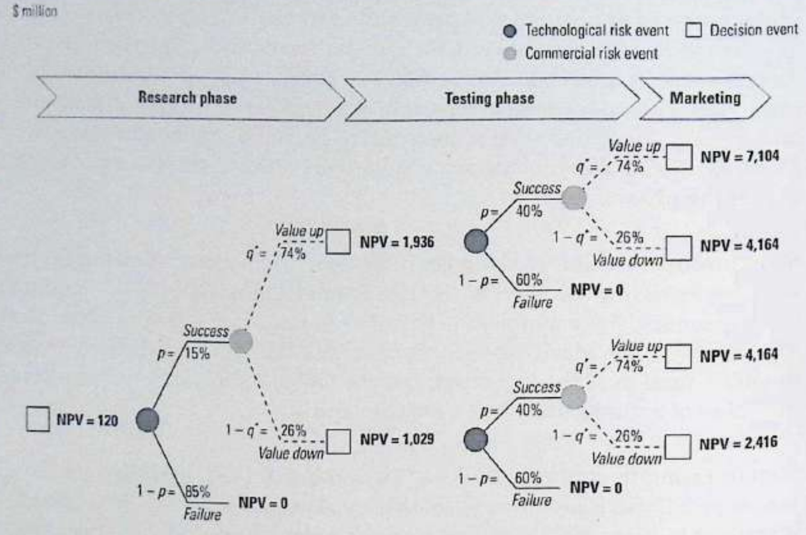
[24] The formula for estimating the upward probability is:

$$\frac{(1+k)^T - d}{u - d} = \frac{1.07^3 - 0.77}{1.30 - 0.77} = 0.86$$

where k is the expected return on the asset.

[25] 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.

EXHIBIT 32.15 **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 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 we 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 we 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 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.

REVIEW QUESTIONS

1. Define contingent net present value (NPV). Outline and explain the differences between standard and contingent NPV.
2. Identify the value drivers embedded in a "real" option and how they might interact.
3. Assume a company runs a plant for which the value one year from now is either $1,000 if market growth is positive or $250 if market growth is

negative. The probability of positive market growth is 60%, and the probability is 40% for negative market growth. At any time, the company can choose to close the plant and collect the scrap value of $285 if scrapped today or $300 if scrapped in one year. The cost of capital for the plant is 10% and the risk-free rate is 5%. Estimate the value of the plant using the standard NPV, decision tree analysis (DTA), and real-option valuation (ROV) valuation models. Explain the differences in results.

4. Under what circumstances should a manager apply a standard NPV approach, a DTA approach, or an ROV approach to valuation?
5. It is often argued that the two most important real options available to a manager evaluating investment decisions are the option to defer an investment decision and the option to abandon an investment decision. Explain the significance of these two options. What insights could the ROV or the DTA model provide into these decisions?
6. The option to defer an investment reduces risk for a company because it does not need to commit the full investment outlay until there is more certainty about the true value of the underlying asset. But the implied cost of capital for the project including flexibility is higher than for the project without flexibility (see, e.g., Exhibit 32.5). Explain why this is the case.
7. When estimating the value of an option on a traded stock, the expected return on the stock is irrelevant—as proven in option pricing theory. For the valuation of an option on an asset that is not traded, such as in the numerical example introduced in Exhibit 32.8, the expected cash flow returns are required. Discuss how that is still consistent with option pricing theory.
8. Consider the example of the valuation of the pharmaceutical R&D project described in the final section of the chapter. Under the assumptions stated, the DTA value is identical to the ROV value. Calculate what volatility (as modeled in terms of parameters u and d) would make the ROV value differ from the DTA value, and discuss what drives this difference.

33

Valuation in Emerging Markets

The emerging economies in Asia and South America will experience strong growth over the coming decades, possibly even recovering from the 2008 recession earlier and faster than many developed economies. Over the long term, many analysts see China and India moving into the ranks of the world's largest economies.[1] This sometimes spectacular economic development will produce many situations requiring sound analysis and valuation. In the rising number of privatizations, joint ventures, mergers, and acquisitions, local financial parties such as banks and capital markets will display growing sophistication. Institutional investors will also continue to diversify their portfolios, adding international holdings in emerging-market stocks.

In Chapters 29 and 30, we discussed the general issues around forecasting cash flows in a foreign currency, estimating cost of capital in a foreign currency, and incorporating high inflation into cash flow projections. In this chapter, we focus on the specific issues that arise in financial analysis and valuation of businesses in emerging markets. Valuation is typically more difficult in these environments because of various risks and possible obstacles to businesses. 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 have yet to agree on how to address them. Methods vary considerably, and practitioners often make arbitrary adjustments based on intuition and limited empirical evidence.

The authors would like to thank André Annema for his contribution to this chapter.

[1] See, for example, D. Wilson and R. Purushothaman, "Dreaming with BRICs: The Path to 2050," Global Economics Paper 99, Goldman Sachs & Co. (October 2003).

Since emerging-market valuations are so complex and there is no agreed-upon method, 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 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 we did in Part Two: historical analysis, forecasting cash flows, estimating the cost of capital, and calculating and interpreting results. We also address two additional steps required for an emerging-market valuation:

1. Creating a consistent set of macroeconomic assumptions regarding, for example, foreign exchange rates, inflation, interest rates, and gross domestic product (GDP) growth
2. Incorporating country risk in the valuation

HISTORICAL ANALYSIS

Accounting conventions in emerging markets may differ substantially from those of developed markets, in which case understanding a company's economics may be difficult. 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 7. Nevertheless, you need to understand the possible differences before starting any valuation of an emerging-market company.

In the case of ConsuCo, there are no major accounting differences to adjust for. Brazilian Generally Accepted Accounting Principles (GAAP) changed at the end of 2006 and have become very similar to U.S. GAAP and International Financial Reporting Standards (IFRS) regarding, for instance, accounting for leases, derivatives, and stock-based compensation. To illustrate, before this change, ConsuCo treated all leases as off-balance-sheet operating

[2] This case illustration is a disguised example.

leases. It now applies the same standards as under U.S. GAAP for classifying leases as either operating or financial, including additional disclosure requirements. Although most leases still remain operating, this doesn't affect our assessment, because we make a standard capital adjustment for operating leases, following the approach described in Chapter 27. One area where a difference remains is goodwill, which can be amortized under Brazilian GAAP. In addition, any goodwill is 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 is not affected, because we add 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 of Chapter 7, rearranging the balance sheet and the income statement to get the statements for net operating profit less adjusted taxes (NOPLAT), invested capital, and free cash flow. We then estimated some key financial ratios on an approximate real-terms basis. Although annual inflation in Brazil has been moderate since 1997 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) over 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 33.1. 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 very much driven by strong growth in 2008, which was mostly due to improved average store performance. Still, average growth since 2003 is 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 has been 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 ROIC performance have deteriorated: EBITDA margin has decreased to around 7 percent since 2005, and ROIC is now about 6 percent.

Performance in 2008 suggests that recently launched initiatives to improve efficiency and productivity are starting to pay off, but a key question is how much further potential remains to be materialized and consequently what levels of long-term growth and return on invested capital (ROIC) are sustainable. Before we discuss our financial forecasts for ConsuCo in more detail, let us review some of the more technical points about assumptions that are fundamental to creating a financial forecast.

EXHIBIT 33.1 **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 (percent)					
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 (percent)					
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

CREATING A CONSISTENT SET OF ECONOMIC ASSUMPTIONS

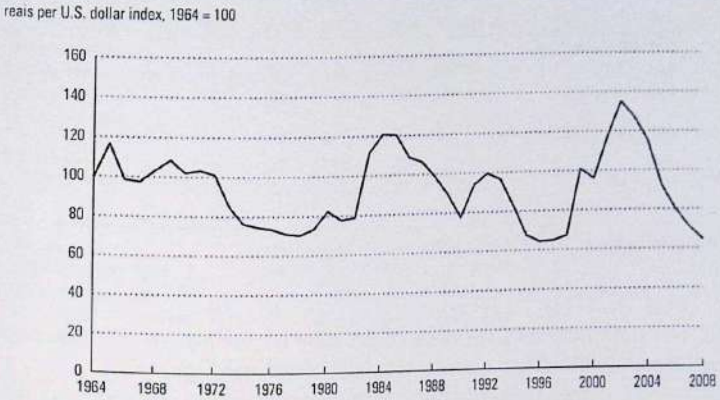
Every forecast of a company's financial performance is based on a set of economic and monetary assumptions about, for instance, exchange rates, inflation rates, and interest rates. In emerging markets, however, these parameters can fluctuate wildly from year to year. It is therefore crucial to make sure not only that each of these parameters is reflected in the financial forecasts of the company, but also that these assumptions are internally consistent. In Chapter 29, we discussed how some fundamental monetary assumptions should be defined consistently to avoid any biases in the valuation results. This becomes even more important when you value companies in emerging markets. We recommend creating one integrated set of economic and monetary assumptions that include, among others, real GDP growth; price inflation (consumer prices, wages, etc.); interest rates; exchange rates; and whatever other parameters are deemed relevant (e.g., oil prices). The purpose is not so much to create the right economic forecasts—these will always be uncertain—but rather to create one or more sets of consistent assumptions to apply to the valuation.

An important parameter is the exchange rate. Like many international companies, the cash flows of emerging-market companies can be denominated in several currencies. Consider a national oil company that exports oil. Its revenues are determined by the dollar price of oil, while many of its costs, especially labor and domestic purchases, are determined by the domestic currency. If foreign-exchange rates perfectly reflected inflation differentials (so that purchasing power parity held), the company's operating margins and cash flows in real terms would be unaffected. In that case, changes in exchange rates would be irrelevant for valuation purposes.

When estimating the impact of exchange rate movements on cash flow forecasts, keep in mind that the evidence shows that purchasing power parity (PPP) does hold over the long run,[3] even between emerging and developed economies. In other words, exchange rates ultimately do adjust for differences in inflation between countries. For example, if you held \$100 million of Brazilian currency in 1964, by 2008 it would have been practically worthless in U.S. dollars. Yet if we adjust for purchasing power, the value of the currency has fluctuated around the \$100 million mark during the 44-year period. Suppose that, instead of holding \$100 million of Brazilian currency, you held \$100 million of assets in Brazil whose value increased with inflation. In about half the years, their value would have been within 15 percent of the original investment, but in other years, it might have deviated much more, either positively or negatively. For example, at the end of 2008, the assets would have been worth approximately \$150 million. Exhibit 33.2 shows the estimated real (inflation-adjusted) exchange rate for the Brazilian currency, which explains this effect.

[3] For an overview, see Alan M. Taylor and Mark Peter Taylor, "The Purchasing Power Parity Debate," CEPR Discussion Paper 4495 (2004).

EXHIBIT 33.2 **Brazilian PPP-Adjusted Dollar Exchange Rate**



Source: MCM Consultants, IMF International Financial Statistics, Datastream

Although PPP may hold in the long term, in the short run exchange rates can move far and fast. For example, in Argentina at the end of 2001, the exchange rate rose from one peso per U.S. dollar to nearly 1.9 pesos per U.S. dollar in 15 days, and to 3.1 pesos per dollar in less than four months. And as Exhibit 33.2 shows, during a period of just two weeks in 1999, Brazil's currency weakened by more than 50 percent relative to the U.S. dollar. Therefore, before making financial projections, assess whether the current exchange rate is overvalued or undervalued on a PPP basis and, if so, by how much. Then model the convergence of currency rates to purchasing power parity within your set of economic and monetary assumptions.

Regardless of any short- or long-term economic exposure to varying exchange rates, your valuation results should be independent of the currency or mix of currencies in which you forecast the company's cash flows. Use actual or synthetic forward exchange rates to convert any future cash flow into another currency. In many emerging economies, the forward-exchange market is nonexistent or illiquid, so actual forward rates provide little guidance on likely future exchange rate movements or inflation differentials. In that case, estimate a synthetic forward rate from your assumptions about future inflation and interest rates for the currencies concerned (see Chapter 30 for details).

In the case of ConsuCo, the underlying exchange rate exposure is limited, as the company has very few cash flows denominated in foreign currency. We have therefore not made any adjustments for a change in the exchange rate, even though the real (Brazilian currency) is at 70 percent of PPP. It might, however, be relevant to consider the indirect impact that a convergence of

EXHIBIT 33.3 **Economic and Monetary Assumptions**

percent

	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: IMF World Economic Outlook.

the real and nominal exchange rates could have on the growth and potential profitability of the Brazilian consumer goods sector and ConsuCo.

Exhibit 33.3 shows the economic and monetary assumptions that we used for ConsuCo's valuation, focusing only on real GDP growth and inflation. Real GDP growth is expected to be between 3 and 4 percent a year, whereas annual inflation is expected to stay just above 4 percent.

FORECASTING CASH FLOWS

Historical analysis showed a turnaround in ConsuCo's performance during 2008. Based on the historical analysis and information from analyst reports up to September 2009, we made the operating and financial forecasts summarized in Exhibit 33.4 in real and nominal terms. We assumed that no major economic crisis will materialize in Brazil after 2010.

We believe that the turnaround of ConsuCo is genuine and sustainable. During the past few years, management of the company has changed, and current management has a strong track record in delivering the turnaround. The company has put a lot of effort into improving same-store sales growth in food, which first showed in 2008's results. In the nonfood segment (items such as furniture and electronics), ConsuCo is also well positioned by having various different formats and channels. These categories currently have a low penetration in Brazil and are expected to show double-digit growth over the years to come. Finally, through some portfolio changes, the company entered new regions in Brazil where it can roll out some of its existing formats.

We therefore assume that the company can 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 expect the Brazilian 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

EXHIBIT 33.4 **ConsuCo: Summary Financial Projections, Base Case**

	2009	2010	2011	2012	2013	2014	...	2019	...	2024
Operating projections										
Sales growth (real, percent)	10.0	10.0	9.0	8.0	7.0	6.0	...	3.8	...	3.0
EBITDA/sales (percent)	7.4	7.6	7.8	7.8	7.8	7.8	...	7.8	...	7.8
Sales/square meter (reais, thousands)	16.0	16.7	17.1	17.4	17.6	17.6	...	17.6	...	17.5
Capital expenditures[1] (reais, millions)	591	671	727	788	853	789	...	1,044	...	1,250
Real projections										
Sales (reais, millions)	13,885	15,274	16,649	17,981	19,239	20,394	...	25,485	...	29,889
Adjusted EBITA/sales (percent)	5.9	6.0	6.1	6.0	6.0	5.9	...	5.6	...	5.3
NOPLAT/sales (percent)	4.3	4.3	4.3	4.1	4.0	3.9	...	3.6	...	3.4
Invested capital/sales (percent)[2]	56.1	55.8	55.7	55.9	56.3	56.3	...	58.8	...	61.2
ROIC (percent)[2]	7.6	7.6	7.7	7.4	7.1	6.9	...	6.2	...	5.6
Nominal projections										
Sales (reais, millions)	14,552	16,663	18,926	21,319	23,815	26,380	...	41,081	...	60,043
Adjusted EBITA/sales (percent)	6.1	6.2	6.4	6.4	6.4	6.4	...	6.3	...	6.2
NOPLAT/sales (percent)	4.4	4.5	4.6	4.5	4.4	4.4	...	4.4	...	4.3
Invested capital/sales (percent)[2]	54.1	52.6	51.4	50.6	50.1	49.2	...	48.2	...	48.2
ROIC (percent)[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

continuing efficiency gains, we expect increasing competition for market share to put downward pressure on the margins at the same time and therefore are conservative about seeing further margin improvement in the continuing-value period.

Capacity requirements and expected capital expenditures are derived from real growth forecasts in combination with assumed increases in sales productivity. We expect sales productivity to improve again over the next few years, with sales per square meter of store space returning to a level similar to that of about five years ago. However, to realize sales productivity, ConsuCo will also have to invest in substantial reformatting of 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 percent of sales will initially drop in real terms but slowly increase again in the longer term.

Although ROIC in real terms will increase until 2011 as a result of improved sales productivity, we expect it to come down after that to just under 6 percent in the continuing-value period. In contrast, the ROIC in nominal terms increases 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, means that free cash flow is negative in those years because of the significant investments that this requires. If growth in capacity and revenues in 2010 were a few percentage points lower, the free cash flow would become positive.

INCORPORATING EMERGING-MARKET RISKS IN THE VALUATION

The major distinction between valuing companies in developed markets and in emerging markets is the increased level of risk in the latter. 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 also have to deal with the risks caused by greater volatility in the local capital markets and macroeconomic and political environments.

There is no consensus on how to reflect this higher level of risk in a premium to the discount rate. The alternative is to model risks explicitly in the cash flow projections in what we call the *scenario DCF approach*. Both methodologies, if correctly and consistently applied, 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 33.5). 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.

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

EXHIBIT 33.5 **Scenario DCF vs. Country Risk Premium DCF**

euros

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."

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 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.[4]

Scenario DCF as Prime Valuation Approach

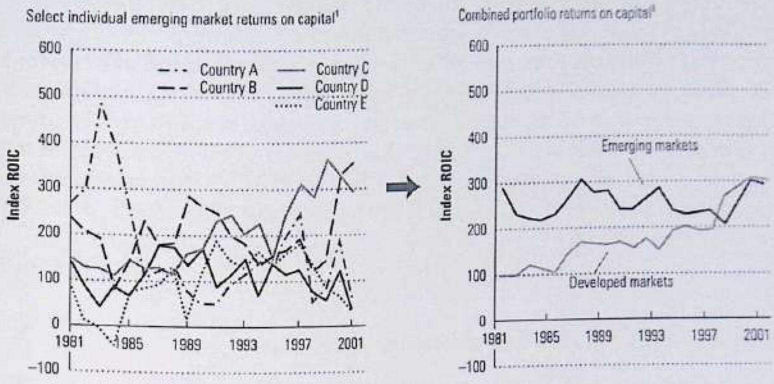
Some surveys show that managers generally adjust for emerging-market risks by adding a risk premium to the discount rate.[5] Nonetheless, we recommend using the scenario DCF valuation as your primary approach and using the country risk premium and multiples approaches for triangulation. Scenario DCF valuation provides a more solid analytical foundation and a more robust understanding of the value than incorporating country risks in the discount rate.

One reason is that 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 33.6. Its returns on invested capital were highly volatile for individual emerging markets, but taken together, 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

[4] 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).

[5] 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).

EXHIBIT 33.6 **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

future events will affect the level of expected cash flows, as in the example in Exhibit 33.5. 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.

Another argument against a country risk premium is that 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 33.6, 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 could overstate the risk for some businesses and understate it for others.

Furthermore, there is no systematic method to calculate a country risk premium. In our example, we could reengineer this premium because the true value of the plant was already known from the scenario approach. In practice, the country risk premium is sometimes set at the spread of the local government debt rate[6] denominated in U.S. dollars and a U.S. government bond of similar

[6] This is also 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 not be applied to expected cash flows, but to promised cash flows (those following a business-as-usual scenario in which no country risk materializes).

maturity. However, that is reasonable only if the returns on local government debt are highly correlated with returns on corporate investments.

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. Last but not least, 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 33.6, setting a country risk premium of 3 percent would be equivalent to assuming a 70 percent probability of economic distress.

Constructing Cash Flow Scenarios and Probabilities

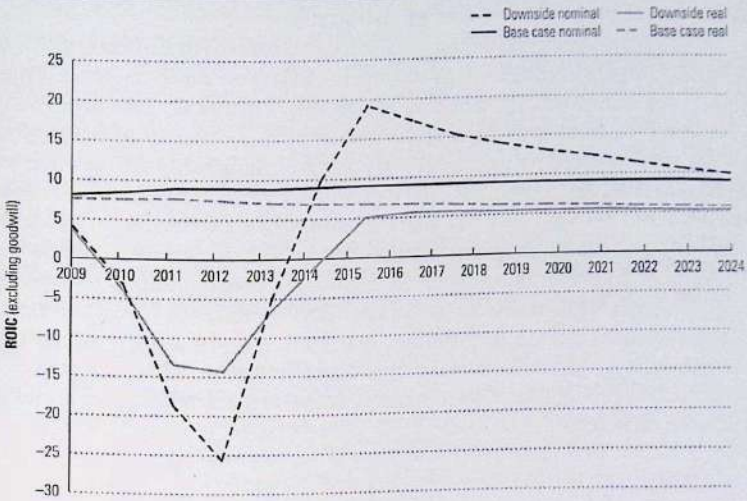
To use the scenario DCF approach, you need to construct at least two scenarios. The base case, or business-as-usual scenario, describes how the business will perform if no major crises occur. The downside scenario describes the financial results if a major crisis does occur.

We have already developed a set of macroeconomic and monetary assumptions for the ConsuCo base case. Now we need to do the same for the downside scenario. The major macroeconomic variables to forecast are GDP growth, inflation rates, foreign-exchange rates, and interest rates. These items must be linked in a way that reflects economic realities and should be included in the basic set of monetary assumptions underlying your valuation. For instance, when constructing a downside scenario with high inflation, make sure that the same inflation rates underlie the financial projections and cost of capital estimates for the company. Foreign-exchange rates should also reflect this pattern of inflation in the long run, because of purchasing power parity.

Given the assumptions for macroeconomic performance, you construct the industry scenarios largely in the same way as for valuations in developed markets. The major difference is the greater uncertainty involved in modeling outcomes under severe crises for which there may be no precedent.

To construct ConsuCo's downside scenario, we analyzed its performance under more adverse economic conditions in the past. 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 was significant. ConsuCo's cash operating margin was 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 real-terms decline in sales for up to five years, followed by a gradual return to the long-term margins and

EXHIBIT 33.7 **ConsuCo: ROIC and Financials, Base Case vs. Downside Scenario**



Financials (percent)	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)	(559)

growth assumed under the business-as-usual scenario. Exhibit 33.7 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 will turn out to be just under half of the base case value. Free cash flow would be several billion reais negative, which would put a strong financing burden on ConsuCo: under such a scenario, ConsuCo would probably have to revise its growth strategy.

While estimating probabilities of economic distress for the cash flow scenarios is ultimately a matter of management judgment, there are indicators to suggest what probabilities would be reasonable. Historical data on previous crises can give some indication of the frequency and severity of country risk and the time required for recovery. Analyzing the changes in GDP of 20 emerging economies over the past 20 years, we found they had experienced economic distress about once in every five years (a real-terms GDP decline of more than 5 percent). 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.[7] Recent academic research suggests that government default probabilities five years into the future in emerging markets such as Argentina were around 30 percent in nondistress years.[8] We estimated the probability of the downside scenario materializing for ConsuCo at around 30 percent.

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. In this section, we provide our fundamental assumptions, background on the important issues, and a practical way to estimate the components of the cost of capital.

Fundamental Assumptions

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

[7] 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.

[8] 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.

become increasingly integrated into global capital markets.[9] We believe that this trend will continue and that most countries will gradually reduce foreign-investment restrictions for local investors in the long run.

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. Of course, if you choose to discount the promised cash flow from the business-as-usual scenario only, you should add a country risk premium.

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 information and data gaps (e.g., for 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.[10] In such cases, estimate the cost of capital on a year-by-year basis, following the underlying set of basic monetary assumptions.

[9] See, for example, C. Harvey, "The Drivers of Expected Returns in International Markets," *Emerging Markets Quarterly* (Fall 2000): 1–17.

[10] Annual consumer price inflation came down to around 5 percent in Argentina in 2004.

- *Don't mix approaches.* Use the cost of capital to discount the cash flows in a probability-weighted scenario 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 11.

Risk-free rate In emerging markets, the risk-free rate is harder to estimate from government bonds than in developed markets. 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.[11] Sometimes you can derive this inflation differential from the spread between local government bond yields denominated in local currency and those denominated in U.S. dollars.[12]

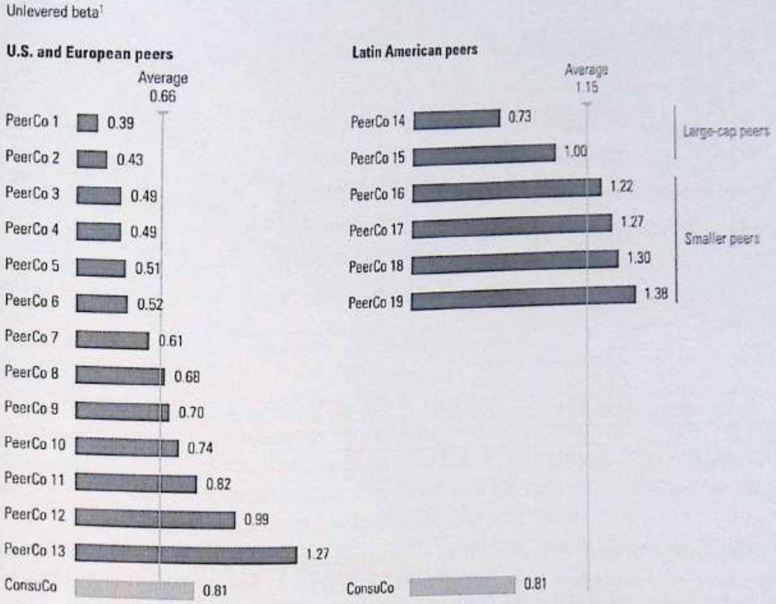
Beta Sometimes practitioners calculate beta relative to the local market index. This is not only inconsistent from the perspective of a global investor, but also potentially distorted by the fact that the index in an emerging market will rarely be representative of a diversified economy. Instead, estimate industry betas relative to a well-diversified or global market index as recommended in Chapter 11.

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 recent economic crisis. The results are presented in Exhibit 33.8. The average beta of

[11] In this way, we do not model the U.S. term structure of interest rates. Technically, this should be included as well, but it will not make a large difference in the valuation.

[12] Technically, this is correct only if the emerging-market bonds are relatively low-risk, as for Chile and South Korea.

EXHIBIT 33.8 **ConsuCo: Estimating Beta**



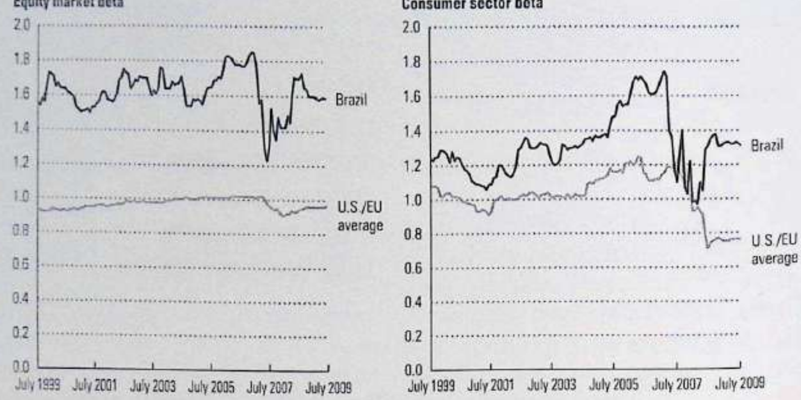
[1] Based on beta development since January 2005, with beta calculated from 5 years of monthly data in dollars.
Source: Datastream.

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 that is above the U.S. and European peer group. However, the 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 this case, we suggest you triangulate your results as follows. First, identify the broader industry or sector index in the emerging market or region where the company is active. Second, examine whether there is any consistent markup over several years in the beta estimate for that index versus a U.S.-European index for the same sector. Third, add the estimated markup, if any, to the beta estimate for a sample of U.S.-European peer companies. We illustrate this process for ConsuCo next.

We examined the beta of the Brazilian market as a whole, as well as the broader consumer goods and services sector in Brazil (which includes more than retail companies). As shown in Exhibit 33.9, the Brazilian betas are in

EXHIBIT 33.9 **Equity Market and Consumer Sector Betas**

Global market index, U.S. dollars



[1] Beta calculated from 5 years of monthly data in dollars.
Source: Datastream.

both cases well above the U.S. and European levels. The beta for the Brazilian market as a whole has been approximately 60 to 70 percent above the United States and Europe over the past decade. However, the industry composition of the Brazilian stock market is quite different from that of the United States and Europe, so this comparison does not reveal much. More meaningful is the comparison of the Brazilian consumer goods and services sector beta with the corresponding U.S. and European sectors. The same exhibit shows that in recent history, the beta for the Brazilian consumer goods and services sector was at a fairly consistent premium of around 25 percent relative to that of the United States and Europe.

Bringing all the evidence together, we estimate ConsuCo's beta at 0.8, which is in fact equal to its own beta estimate. It corresponds to a 25 percent premium[13] to the average asset beta for the U.S. and European retail peers and is in line with ConsuCo's larger Latin American peers.

Market risk premium As discussed in Chapter 30, excess returns of local equity markets over local bond returns are not a good proxy for the market

[13] 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 33.10 **ConsuCo: Cost of Equity Estimate**

percent

	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: IMF World Economic Outlook, Bloomberg.

risk premium. This holds even more so for emerging markets, given the lack of diversification in the local equity market. Furthermore, the quality and 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 11) of 4.5 to 5.5 percent.

In Exhibit 33.10, we summarize the nominal cost of equity calculation for ConsuCo in the base case scenario. In this scenario, we have assumed a fairly stable inflation rate for the Brazilian economy. Due to the global slowdown, near-term inflation is expected to decrease somewhat and come back to about 4.5 percent in 2014, beyond which we have assumed it to be constant. For the downside scenario (not shown in the exhibit), inflation projections follow a different trajectory, and the cost of capital for this scenario is adjusted accordingly. (The resulting cost of equity is shown later, in the WACC estimate table, Exhibit 33.12.)

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 (see Chapter 11 for details on the systematic part of credit spread), 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.

EXHIBIT 33.11 **ConsuCo: Cost of Debt Estimate**

percent

	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

This explains why the funding costs of multinationals with extensive emerging-market portfolios—companies including Coca-Cola and Colgate-Palmolive—have a cost of debt that is no higher than that of their mainly U.S.-focused competitors.

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 estimate 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, as shown in Exhibit 33.11. Of course, the inflation assumptions underlying the estimates for cost of debt should be consistent with those for the base case and the downside 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 WACC estimate. 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.

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

EXHIBIT 33.12 **ConsuCo: WACC Estimate**

percent

	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

global competitors. You could forecast explicitly how the company e
a capital structure that is more similar to global standards. In that
should consider using the adjusted present value (APV) approach
in Chapter 6.

For the ConsuCo case, we set the capital structure close to th
average at a ratio of debt to enterprise value of 0.3, which is als
its long-term historical levels. Exhibit 33.12 summarizes the W
for the base case and the downside scenario in nominal terms
extreme inflation assumption underlying the downside sce
radically higher cost of capital in the crisis years until 20
to fall.

Estimating the Country Risk Premium

If you are discounting business-as-usual cash flows i
flows, you should add a country risk premium to the
in this chapter in the section on incorporating eme
valuation. There is no agreed-upon approach to es
we have some advice.

Do not simply use the sovereign risk premium premium equals the difference between a lo
ernment bond yield and a dollar-denomina
with the same maturity. This difference will
try risk premium only if the cash flows of
closely in line with the payments on gove

[14] Some emerging markets' country debt is partiall
by U.S. Treasury bonds. For these bonds, you ne
the bond, the stripped yield. Stripped yields are

the case. In the consumer goods or raw-materials sector, for example, cash flows are only weakly correlated with local government bond payments and are less volatile.

Understand estimates from different sources Estimates for country risk premiums from different sources usually fall into a very wide range, because analysts use different methods.[15] But they frequently compensate for high estimates of country risk premiums 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 extremely 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.

Be careful to avoid setting the country risk premium too high Make sure you understand the economic implications of a high country risk premium. We believe that a country risk premium for Brazil is far below the premiums of 5 percent and higher that analysts typically use.

One reason is that current valuations in the stock market do not support the discount rates implied by higher risk premiums. We estimated the trading multiples of enterprise value to the 2009 forecasted EBITA for the 50 industrial companies in the Bovespa, the Brazilian equity market index. The median value for the multiple was 7.8 in September 2009. We estimated the implied WACC by means of a DCF valuation. We set the future long-term return on invested capital at 12 percent, approximately equal to the median historical ROIC for these companies from 2004 to 2008. Assuming future long-term inflation at 4.5 percent and real growth at 3.5 percent for the Brazilian economy as a whole, the WACC for the Brazilian market implied by the EBITA multiple of 7.8 is around 10.8 percent. The WACC estimated with the CAPM previously described is around 10.0 percent.[16] This would imply a country risk premium for Brazil of around 0.8 percent. Of course, this is not a precise estimate; as the Brazilian market goes up and down, the implied WACC and country risk premium would change as well. But it does suggest a country risk premium that is far below the 5 percent that many analysts currently use.

[15] For an overview, see, for example, L. Pereiro, *Valuation of Companies in Emerging Markets: A Practical Approach* (New York: John Wiley & Sons, 2002), 118.

[16] Based on a real risk-free rate of 2 percent, long-term inflation of 4.5 percent, a market risk premium of 5.0 percent, cost of debt of 7.7 percent, and a debt-to-capital ratio of 0.25.

The other reason for such a low country risk premium is that historical returns in the Brazilian stock market do not support a high premium. The average real-terms return on the Brazilian stock market between December 1994 and December 2008 was approximately 5.5 percent per year, far below the level that would support a substantial country risk premium.

CALCULATING AND INTERPRETING RESULTS

Given the estimates for cash flow and the cost of capital, we can 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 33.13. 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

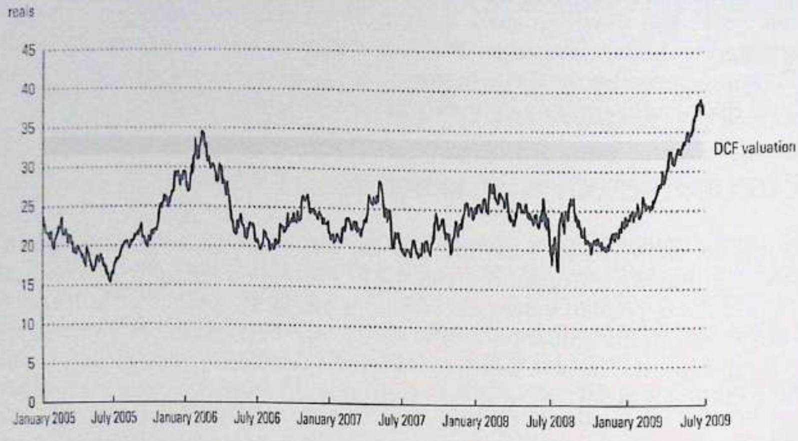
EXHIBIT 33.13 **ConsuCo: Scenario DCF Valuation**

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 (percent)	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 (percent)	6.0	5.1	4.9	4.7	4.5	4.4	...	4.4	...	4.4
	DCF value	14,451									
	Nonoperating assets	1,139									
Probability 70%	Debt and debt equivalents	(5,605)									
	Equity value	9,985									
	Value per share	42.4									
	Downside scenario										
	Nominal projections										
	Free cash flow	(149)	(777)	(2,533)	(4,504)	(2,677)	(558)	...	250	...	834
	WACC (percent)	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 (percent)	6.0	3.5	1.0	0.8	2.9	4.3	...	4.4	...	4.4
	DCF value	6,313									
	Nonoperating assets	1,139									
Probability 30%	Debt and debt equivalents	(5,605)									
	Equity value	1,847									
	Value per share	7.9									

EXHIBIT 33.14 **ConsuCo: Historical Share Price Development**



Source: Datastream.

value of the nonoperating assets, and subtract the financial claims to get at the estimated equity value. The estimated equity value obtained for ConsuCo is about 32 reais per share, given a 30 percent probability of economic distress.

ConsuCo's share price, like the Brazilian stock market in general, has been quite volatile over recent years, as shown in Exhibit 33.14. Thus, you need to be careful in comparing the valuation outcome with the current (October 2009) share price. The share price development of ConsuCo clearly shows the rally since the beginning of 2009, following the first impact of the turnaround. Remember that the base case in our DCF model also assumes a recovery in sales productivity and growth performance. It is therefore not surprising that the DCF valuation comes out above the share price level of recent years. Obviously, any concerns around the continuation of results from the turnaround program would have significant implications for the DCF value.

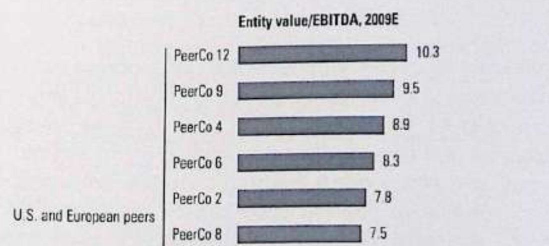
In contrast to share prices in developed markets, share prices in emerging markets are not always reliable references for intrinsic value, for several reasons. First, free float is often limited, with large equity stakes in the hands of a small group of owners, leaving public shareholders with little 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 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.

ConsuCo has a primary listing on the Brazilian stock exchange. Turnover in the stock, as measured by the number of days to trade the free float, is not much different from typical levels in the United States and Europe. Still, because of the share price volatility, it is important to triangulate the DCF results with multiples and a country risk premium approach.

Triangulating with Multiples and Country Risk Premium Approach

To triangulate with multiples, we apply Chapter 14's guidance on how to do 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 are forward-looking multiples over EBITDA as expected for 2009. As Exhibit 33.15 illustrates, the implied multiple from our ConsuCo valuation is significantly higher than for U.S. and European peers but at the low end of the range for Latin American peers. Given the higher growth outlook for ConsuCo in the Brazilian market compared with that of large established chains in the United States and Europe (partly because of the relatively low penetration of durable goods in Brazil), the higher multiple is not surprising. Relative to regional peers, ConsuCo is already very well established and geographically widespread. It also has somewhat more exposure than listed peers have to the lower-growth food segment. Hence, a multiple at the low end of the range is not unreasonable.

EXHIBIT 33.15 **ConsuCo: Multiples Analysis vs. Peers**



The last part of the triangulation consists of a valuation of ConsuCo using a country risk premium approach. Earlier in this chapter, we estimated the country risk premium for Brazil at around 0.8 percent. Discounting the business-as-usual scenario at the cost of capital plus this country risk premium leads to a value per share of 20 reais, significantly below the 32-reais result obtained in the scenario DCF approach (more than 35 percent lower). 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 growth in the near term and corresponding investments, its free cash flows are 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: a markup in WACC cumulates over time, making long-term risk adjustment exert more downward pressure on present value than near-term adjustment. This does not happen in a scenario approach, because the scenario probabilities affect all future cash flows equally. If ConsuCo were to have a lower-growth outlook, the country risk premium approach would produce 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 Brazil) would either result in unrealistically low valuations relative to current share price and peer group multiples, or require 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, the application of 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 the values of companies 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.

REVIEW QUESTIONS

1. Define *purchasing power parity*. What is the importance of purchasing power parity when you are trying to establish value for a company located in an emerging market?
2. Identify four risks associated with emerging markets that affect enterpri discounted cash flow (DCF) valuation. How should these risks be trea within the enterprise DCF model?
3. Describe the benefits of a scenario DCF valuation model. What factors sh be considered when constructing scenario parameters?
4. You are computing the value of a firm headquartered in an emerging r Identify the factors unique to an emerging market that need to be ev when estimating the cost of equity using the Capital Asset Pricin (CAPM).
5. Volatilities for individual stock and market indexes in emerging are typically higher than those for U.S. stocks and indexes. Shoul that the cost of capital for investments in emerging economies is Explain your answer.
6. Discuss the relative merits of including risk adjustments or in discount rates—especially for high-growth compani markets—and show how both approaches can be aligned.
7. To estimate the beta for a Brazilian telecommunications co collected a sample of telecom peers in Latin America a in the United States and Europe. The median beta ve is around 1.5 for the Latin American and Asian peer the U.S. and European peers (both subsamples are su would you have to believe to choose either the Latin beta or the U.S./European peer beta? What additic undertake to test either choice?
8. Many emerging economies have restrictions on their growth and stability; for example, they repatriated profits by foreign companies. Wher such taxes in the DCF valuation of your co growth emerging economy, if the taxes are gradually decreased to zero over the next mature?

34

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. The best way to value high-growth companies (those whose organic revenue growth exceeds 15 percent annually) 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-earnings 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, and this chapter details the differences. Instead of analyzing historical 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 multiple scenarios. Each scenario details how the market might develop under different condi-

[1] In Chapter 32, 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.

tions. 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.

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.

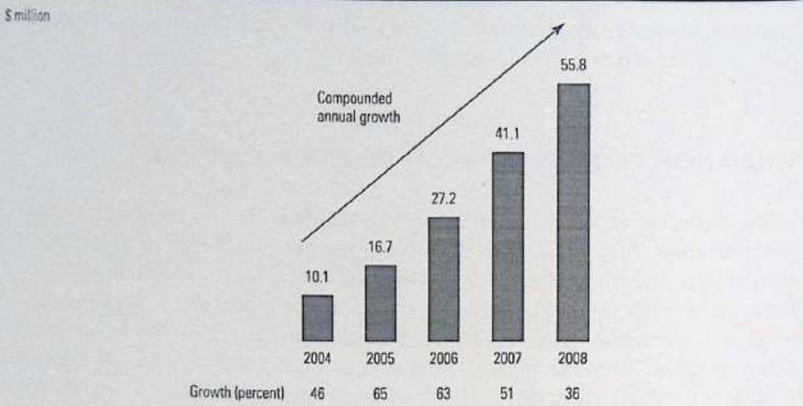
Once you have developed a long-term future view, work backward to link the future to current performance. Accounting records of current performance are likely to mix together investments and expenses, so when possible, capitalize hidden investments, even those expensed under traditional accounting rules. 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, ease of competitive entry, 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, valuations that rely too heavily on unrealistic assessments can lead to overestimates of value and to 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 penetration rates, average revenue per customer, and sustainable gross 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.

EXHIBIT 34.1 **OpenTable: Revenues**

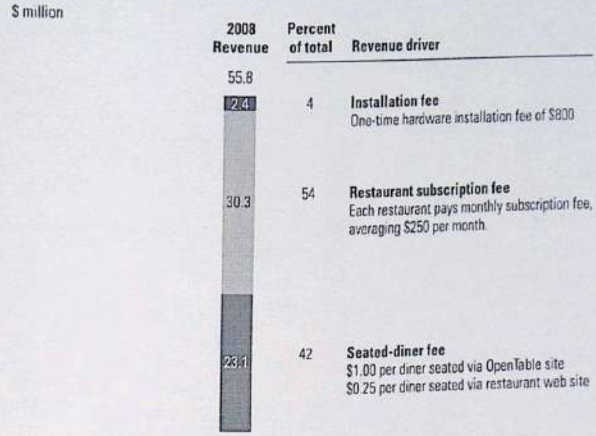


To demonstrate the specifics of the valuation process, let's examine OpenTable, an online provider of restaurant reservations. Between 2004 and 2008, revenues grew from $10 million to almost $56 million, representing a compounded annual growth rate of 53 percent per year (see Exhibit 34.1). As of 2008, approximately 34 million diners had used OpenTable to book reservations at 10,335 restaurants. More than 90 percent of the company's revenues are generated in the United States, but the company now handles reservations for restaurants in Germany, Japan, and the United Kingdom as well.

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) revenue. 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. In the case of OpenTable, the company provides the end customer with an online up-to-date list of available restaurant seating near the customer's location. The list can be sorted by cuisine, price, and other features, and each restaurant provides a description of its establishment. With a single click, the user can select a restaurant, select a time for seating, and get directions. Although OpenTable provides a convenient service to the customer, it is not clear the customer will pay for this service. Most restaurant names appear on one site or another, so the customer can search for a restaurant and then dial the restaurant directly.

Instead of charging the end customer, OpenTable licenses a product called Electronic Reservation Book (ERB). Since many restaurants do not have computer technology, OpenTable installs a proprietary computer system that manages reservations, manages table seating, recognizes guests, and markets through e-mail. In return, the restaurant pays a one-time installation fee of $800, a monthly subscription fee averaging $250 per month, and seated-diner

EXHIBIT 34.2 **OpenTable: Business Model**



fees of $1 per diner seated via OpenTable and 25 cents per diner seated via the restaurant's web site.[2] Exhibit 34.2 presents OpenTable's 2008 revenue breakdown by installation fees, subscription fees, and seated-diner fees.

Using these drivers as a guide, start by estimating the potential market for OpenTable, product by product. For the purpose of exposition, this chapter examines only one source of revenue in detail: restaurant subscription fees. We estimated the remaining two products (and future products) using a similar methodology, although the analysis is not presented here.

Sizing the market To forecast the potential market for subscription fees, first estimate the potential number of restaurants OpenTable can serve. According to management, OpenTable currently serves 30 percent of the 30,000 U.S.-based *reservation-taking* restaurants. The number of all U.S. restaurants is not a helpful anchor, since most U.S. restaurants serve fast food; the customer merely walks in and orders. All restaurants constitute the *total* market, whereas reservation-taking restaurants constitute the *addressable* market, a critical distinction in market sizing.

Since growth in restaurants matches that of the U.S. economy, the majority of OpenTable's subscription growth will come from higher penetration. To set an upper bound on the estimate of OpenTable's potential market share, consider San Francisco, the company's first market. As of 2008, the company served 60 percent of San Francisco reservation-taking restaurants—twice its

[2] To incentivize diners to use OpenTable and not book directly through the restaurant, OpenTable provides them with reward points for each booking.

EXHIBIT 34.3 **OpenTable: Market Share and Potential Market, 2008**

Source: Company reports.

share of the addressable U.S. market (see Exhibit 13.3). In our forecasts, we assume OpenTable can reach a 60 percent penetration nationwide by 2018.

For most start-ups, forecasting a 60 percent share is extremely aggressive, since additional competition is likely to enter the market. For this business, however, the largest company is likely to capture the entire online market. Restaurants desire a partner that generates the most traffic, and diners desire a web site with the most restaurants. 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.

OpenTable estimates the number of reservation-taking restaurants in 2008 at 30,000. If the number of restaurants grows at 2 percent per year (twice the rate of population growth), this leads to an estimate of just over 36,500 restaurants by 2018. At a 60 percent share, OpenTable would serve 21,900 restaurants by 2018 in the United States. OpenTable has also entered international markets. For simplicity, we assume the growth in international restaurants will match that of U.S. restaurants, delayed by six years.[3] Therefore by year-end 2018 total restaurants served are projected at 37,930 restaurants.

Next, to convert restaurants served into total subscription revenues, multiply the number of restaurants by the estimated subscription revenue per restaurant. In 2018, OpenTable is projected to generate \$431 per month, or \$5,172 per year, in subscription revenue. Multiplying \$5,172 per restaurant by average 2018 restaurants of 36,840 leads to a 2018 forecast of \$190.7 million in restaurant subscription revenues. We present this calculation in Exhibit 34.4.

[3] If we were valuing OpenTable for the purpose of investment, we would build a detailed international forecast, country by country. Since we are examining OpenTable to demonstrate the process of valuation, we simplify the forecast methodology.

EXHIBIT 34.4 **OpenTable: Partial Revenue Model**

$ million

		Forecast									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Revenue											
Installation revenues	2.4	3.0	3.7	4.6	4.9	4.9	5.0	4.2	4.9	4.4	4.1
Restaurant subscription revenues	30.3	40.5	51.2	66.3	82.3	99.0	116.3	134.2	152.8	172.0	190.7
Seated diner revenues	23.1	28.4	35.7	43.7	54.1	63.9	73.8	83.5	93.0	103.0	112.0
Total revenues	55.8	72.0	90.7	114.6	141.2	167.9	195.0	221.8	250.7	279.4	306.8
Number of restaurants (year-end)											
U.S.	9,295	10,760	12,730	14,460	16,030	17,430	18,640	19,680	20,560	21,290	21,900
International	1,040	1,611	2,423	3,873	5,583	7,391	9,295	10,760	12,730	14,460	16,030
Number of restaurants	10,335	12,371	15,153	18,333	21,613	24,821	27,935	30,440	33,290	35,750	37,930
Restaurant subscription revenues											
Average restaurants during year	9,098	11,353	13,762	16,743	19,973	23,217	26,378	29,188	31,865	34,520	36,840
Subscription revenue per month (dollars)	277	297	310	330	343	355	367	383	400	415	431
Restaurant subscription revenues	30.3	40.5	51.2	66.3	82.3	99.0	116.3	134.2	152.8	172.0	190.7
Share of U.S. restaurants (percent)	31	35	41	45	49	53	55	57	58	59	60

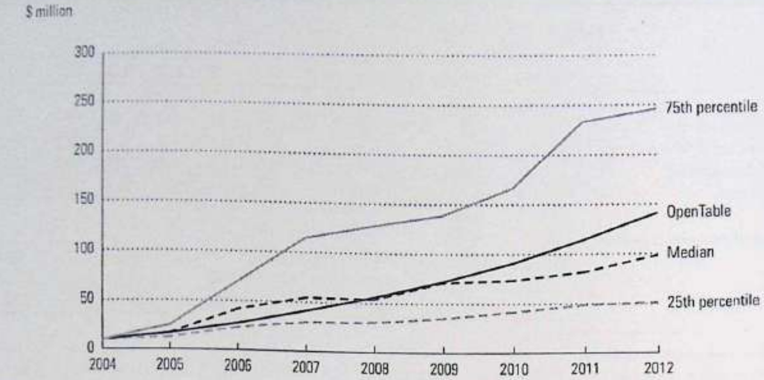
Source: Morgan Stanley, Think Equity LLC, company reports.

Assessing reasonableness Sizing the potential market for OpenTable requires numerous inputs, each of which is uncertain. Small miscalculations in individual forecast items can compound into large mistakes in aggregate. Therefore, search for clever checks to test your forecast. To put OpenTable's revenue growth in perspective, compare it with the first five years of revenue growth for Internet companies founded in the 1990s, once each company hit $10 million in revenue (see Exhibit 34.5). Between 2004 and 2008, OpenTable grew revenues from $10.1 million to $55.8 million, which matches the median Internet company passing the same threshold.[4] By 2012, research analysts project OpenTable to grow revenues to $141.2 million, slightly higher than the median Internet company but well within the bounds of the distribution.

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. For internal cost projections, we rely on company projections presented in Exhibit 34.6. Senior management recently discussed how economies of scale will lead to target margins between

[4] Median revenue provides a better comparison than average revenue. Average revenue is distorted upward by a handful of superstars, such as Amazon.com. The average is also affected by companies that fail, making any direct comparison awkward.

EXHIBIT 34.5 **Revenue Growth after Reaching $10 Million Threshold**[1]

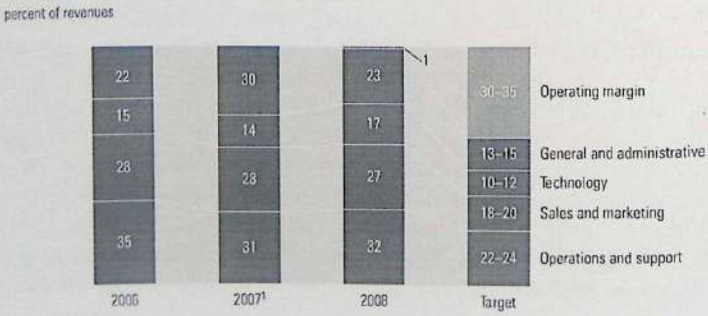


[1] Sample of 75 publicly traded Internet start-ups, normalized to OpenTable.

30 and 35 percent. Management forecast that every expense (operations, sales, technology, etc.) will drop as the company reaches scale.

OpenTable management projects eventual margins of 30 to 35 percent, but are these realistic? To address this question, examine other Internet companies that provide a similar conduit between consumers and businesses. For instance, online travel brokers (brokers that book reservations for air travel and hotels on behalf of consumers) have grown into a multibillion-dollar industry over the past 15 years. Exhibit 34.7 presents financial data for three public companies that dominate the online travel industry: Expedia, Priceline.com, and Orbitz Worldwide. For the three companies, there is a direct correlation

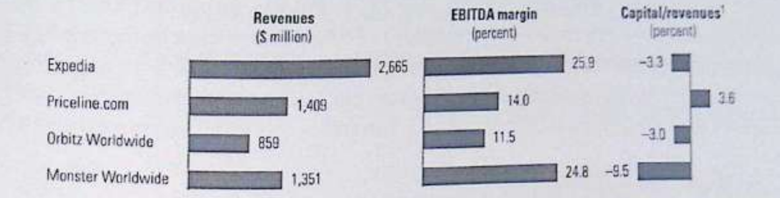
EXHIBIT 34.6 **OpenTable: Current and Target Margins**



[1] Total sums to 103 percent of revenues because of operating losses.

Source: Company reports.

EXHIBIT 34.7 **Online Brokers: Key Value Drivers, 2007**



[1] Capital turnover excludes goodwill and acquired intangibles and net merchant bookings.

between total revenues and margin. The largest company, Expedia, generates a 25.9 percent EBITDA margin, whereas the smallest player, Orbitz Worldwide, generates only 11.5 percent.[5] Given that OpenTable is a market leader with little competition, exceeding Expedia's EBITDA margin of 25.9 percent appears reasonable.

Perhaps a better comparison is Monster Worldwide. Monster provides online career services that match job seekers with potential employers. Unlike the highly competitive travel industry, Monster competes in a market where the largest player has a natural advantage. Similar to OpenTable's market, job seekers want to affiliate with a site that contains the most job postings, and employers want to post employment on a site with the most candidates. By 2007, Monster generated more than $1.3 billion in revenue and EBITDA margins of 24.8 percent. Based on this data, 30 to 35 percent appears somewhat aggressive. What prevents Monster Worldwide from reaching margins above 25 percent? Answering this question could provide a key insight concerning OpenTable's future.

To convert after-tax operating profit into cash flow, we next forecast capital requirements. Most businesses require significant capital to grow. This is not the case for OpenTable. In 2008, Open Table generated $5.5 million of capital on $55.8 million of revenues.[6] This is because operating liabilities, which include accounts payable and customer prepayments, exceed operating assets like property and equipment. Can OpenTable expect operations to continue providing capital? An analysis of other online companies says yes. Three of the four companies presented in Exhibit 34.7 have negative invested capital. Similar to OpenTable, Monster Worldwide generates 9.5 cents in capital for every $1 in revenue.

[5] In the online travel industry, most analysts analyze margin using earnings before interest, taxes, depreciation, and amortization (EBITDA). To remain consistent with their analysis, we do the same.

[6] Nearly every company invests capital to grow and consequently has positive invested capital. In a few cases, such as OpenTable, a company can have negative invested capital. This occurs when stakeholders such as customers, suppliers, and employees provide more capital than is needed for receivables, inventory, property, and equipment. To compute invested capital, we used the methodology outlined in Chapter 7.

With positive operating profits and negative invested capital, return on invested capital (ROIC) is no longer meaningful—mathematically, it is infinite. But what about the competition? If ROIC is infinite, shouldn't competitors enter and eventually force prices down? Perhaps, but the characteristics of OpenTable's market have created significant barriers. Second, because of rigid accounting rules, invested capital is probably understated, especially if early losses are reclassified as investments. 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 back 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, there are more questions than 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 8 percent 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

EXHIBIT 34.8 **OpenTable: Key Drivers by Scenario, 2018 Forecast**

	Total revenues ($ million)	Total restaurants	Average subscription fee ($ per month)	Operating margin (percent)	Description
Scenario A					
Product extension	510	37,900	890	34	Installations grow as planned and subscription revenues double as new products are introduced.
Scenario B					
Base case	310	37,900	430	31	U.S. and international markets grow as planned. Margins stabilize at 31%.
Scenario C					
Slow international penetration	220	27,000	430	31	U.S. market continues to grow as planned, but international market fails to meet expectations.

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, some pessimistic. For OpenTable, we have developed three potential scenarios for 2018, summarized in Exhibit 34.8.

In scenario A, we assume OpenTable progresses better than expected. The company parlays reservation management into general restaurant management, including food and beverage management, staffing, and accounting systems. By replacing competitors, OpenTable is able to more than double expected subscription fees for 2018, from $430 per restaurant to $890 per restaurant. This assessment leads to an estimated equity valuation of $1,140 million.

In scenario B, our base scenario, revenues grow to $310 million, restaurants served grow to 37,900, subscription fees average $430 per restaurant, and operating margins rise to 31 percent. In this scenario, OpenTable has an estimated equity value equal to $719 million.

Scenario C assumes that OpenTable generates only $220 million in revenue by 2018 because the international expansion goes poorly. Although the company has grown in the United Kingdom, Germany, and Japan, the company withdrew from France and Spain in 2008. If international growth is sluggish, the company will capture fewer restaurants. Over the short term, margins will stumble, only to rebound as OpenTable focuses on successful markets. In this scenario, OpenTable has an equity value of $545 million.[7]

[7] In pessimistic scenarios, the value of debt can exceed operating value. In these cases, set debt equal to operating value and value equity at zero. For more on scenario analysis and its impact on financial claims, see Chapter 13.

EXHIBIT 34.9 **OpenTable: Probability-Weighted Expected Value**

Scenario	Intrinsic equity valuation ($ million)	×	Probability (percent)	=	Contribution to equity valuation ($ million)
Product extension	1,140		20		228
Base case	719		50		360
International expansion fails	545		30		164
			100		751
			Millions of shares		22.0
			Value per share		34.2

Weight Scenarios Consistently with Historical Evidence

To derive current equity value for OpenTable, weight the potential equity value from each scenario by its estimated likelihood of occurrence. Exhibit 34.9 lists the potential equity value and the probability of occurrence for each scenario. To estimate the company's current equity value, find the sum of each scenario's contribution. Based on our probability assessments, we estimate OpenTable's equity value at $751 million and value per share at $34. In May 2009, OpenTable went public. Shares closed at $31.89 on the first day of trading.

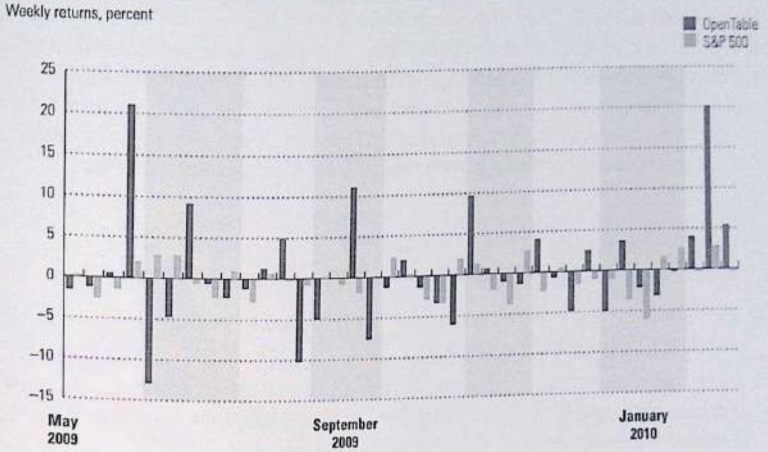
Scenario probabilities are unobservable and highly subjective. As a result, the final valuation will be quite sensitive to probability weightings. Thus, any set of forecasts built on fundamental economic analysis—such as market size, market share, and competitor margins—should be calibrated against the historical performance of other high-growth companies. Otherwise, assigning too high a weight to an implausible scenario could make the valuation too high (or it will be too low if you are overly conservative).

UNCERTAINTY IS HERE TO STAY

By adapting the DCF approach, we can generate reasonable valuations for dramatically changing businesses. But investors and companies entering fast-growth markets like those related to the Internet should expect to face huge uncertainties. To see this, look at what could happen under our three scenarios to an investor who holds a share of OpenTable stock for five years after buying it in 2009 for $31.89. 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 2009 the market will seem to have undervalued OpenTable. An annual return of 19 percent may not seem very high, but recall that much of OpenTable's potential success is already incorporated into the company's stock price. If scenario C plays out, the investment will generate only 3 percent a year,

EXHIBIT 34.10 **OpenTable and S&P 500: Share Price Volatility**



and it will appear that the company was overvalued in 2009. 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. OpenTable, for instance, had three times the volatility of the S&P 500 during its first year of trading (see Exhibit 34.10). As OpenTable'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 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 make some adaptations when valuing these companies: starting from the future rather than the present when making your forecast, thinking in terms of probabilities, and understanding the economics of the business model compared with peers. Though you cannot reduce the volatility of these companies, at least you can understand it.

REVIEW QUESTIONS

1. Explain how the process of valuing a high-growth company differs from valuing an established company.
2. How does the total market for a new product differ from a company's addressable market? Which market is more relevant for forecasting a company's revenues?
3. For a company with a new product, how can you estimate its potential market share?
4. How do you estimate the potential margin and capital turnover for a young, high-growth company? Are the company's current margin and capital turnover relevant?
5. Why do most young, high-growth companies have negative earnings?
6. Last year, GrowthCo traded at $20 per share. Over the past 12 months, the company's share price rocketed to $60 per share. Does this mean the share price was misvalued last year?

35

Valuing Cyclical Companies

A cyclical company is one whose earnings demonstrate a repeating pattern of significant increases and decreases. The earnings of such companies, including those in the steel, airline, paper, and chemical industries, fluctuate because of large changes in the prices of their products. In the airline industry, earnings cyclicality is linked to broader macroeconomic trends. In the paper industry, cyclicality is largely driven by industry factors, typically related to 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, and 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.

In this chapter, we explore the valuation issues particular to cyclical companies. We start with an examination of how the share prices of cyclical companies behave. This leads to a suggested approach to valuing these companies, as well as possible implications for managers.

SHARE PRICE BEHAVIOR

The share prices of companies with cyclical earnings tend to be more volatile than those of less cyclical companies. But their discounted cash flow (DCF) valuations are much more stable. So are cyclical companies exceptions to the rule that market values generally track return on invested capital (ROIC) and growth (see Chapter 15)?

When Market and DCF Valuations Diverge

Suppose you were using the 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 35.1, 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 Exhibit 35.1, Part 2.

Exhibit 35.1, Part 3, compares the cash flows and the "perfect foresight" DCF values (the values are indexed for comparability). It shows that the DCF value is far less volatile than the underlying cash flow. In fact, the DCF value displays almost no volatility, because no single year's performance has a significant impact on the value of the company.

EXHIBIT 35.1 **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

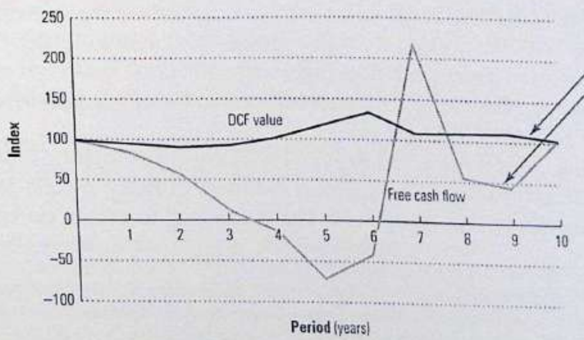
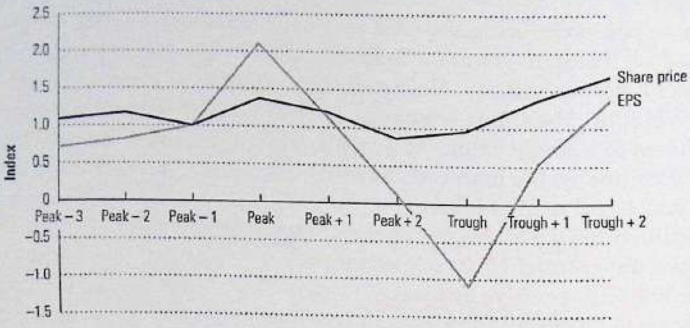


EXHIBIT 35.2 **Share Prices and EPS: 15 Cyclical Companies**



In the real world, the share prices of cyclical companies are less stable. Exhibit 35.2 shows the earnings per share (EPS) and share prices (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 described in Chapter 17.

Are Earnings Forecasts the Culprit?

How can we explain this apparent anomaly? We examined equity analysts' consensus earnings forecasts for cyclical companies to see if they provided any clues to the volatile stock prices of these companies.

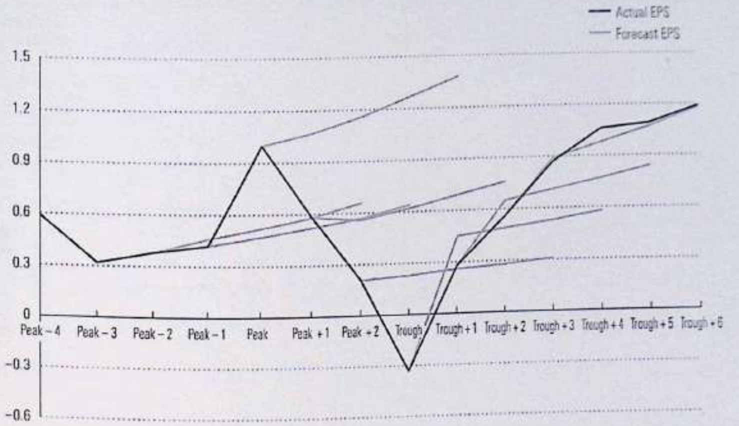
What we found surprised us. Consensus earnings forecasts for cyclical companies appeared to ignore cyclicality entirely. The forecasts invariably showed an upward-sloping trend, whether the companies were at the peak or trough of the cycle. What appeared was not that the DCF model was inconsistent with the facts, but that the earnings and cash flow projections of the market (assuming the market followed the analysts' consensus) were to blame.

The conclusion 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 35.3 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

[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.

EXHIBIT 35.3 **Actual EPS and Consensus EPS Forecasts: 15 Cyclical Companies**



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. You might say that the forecast does not even acknowledge the existence of a cycle.[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 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.

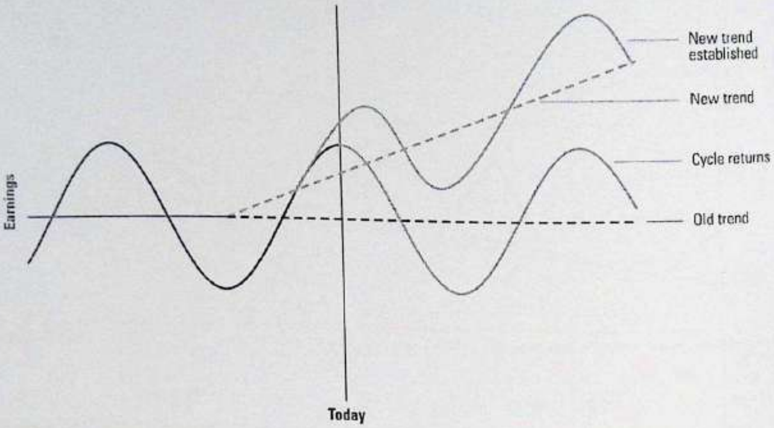
The Market Appears Smarter than the Consensus Forecast

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,

[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 35.4 **When the Cycle Changes**



we would be disappointed if the stock market entirely missed the cycle, as the consensus earnings analysis 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 35.4.

Suppose you are valuing a company that seems to be at a peak in its earnings cycle. In reality, 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.

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 35.5 **Market Values of Cyclical Companies: Forecasts with Three Levels of Foresight**

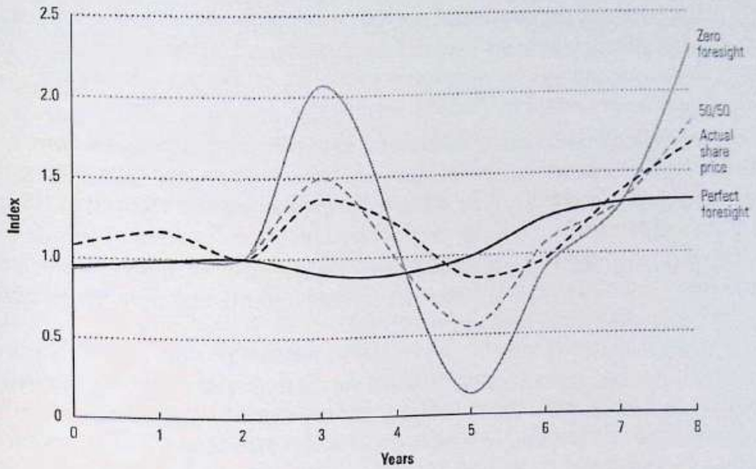


Exhibit 35.5 summarizes the results, comparing them with actual share prices. As shown, the market does not follow either the perfect-foresight or the zero-foresight path; it follows a blended path, much closer to the 50/50 path. So the market has neither perfect foresight nor zero foresight. One could argue that this 50/50 valuation is the right place for the market to be.

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 we used in Chapter 13 and the high-growth-company valuation in Chapter 34. The probabilistic approach 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 (in four steps) for valuing cyclical companies (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 recent performance of the company. 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 value. Use the economic rationale and its likelihood to estimate the weights assigned to each scenario.

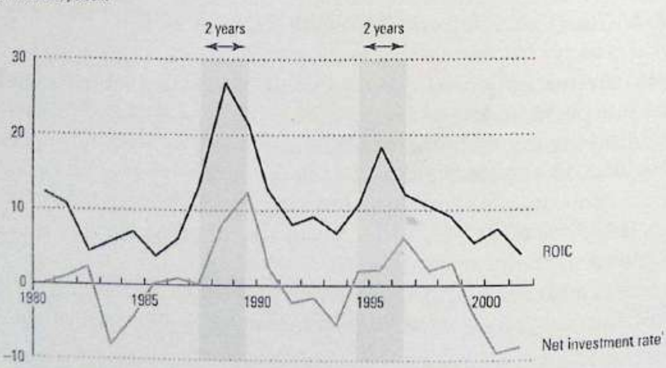
This approach provides an estimate of the value as well as scenarios that put boundaries on the valuation. Managers can use these boundaries to improve their strategy and respond to signals about which scenario is likely to occur.

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 drives cyclicality. Exhibit 35.6 shows the

EXHIBIT 35.6 **ROIC and Investment Rate: Commodity Chemicals, 1980–2001**

North American medians, percent



[1] Change in property, plant, and equipment (PP&E) adjusted for inflation.

Source: McKinsey chemicals database (CLTPD)

ROIC and net investment in commodity chemicals from 1980 to 2001. 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.

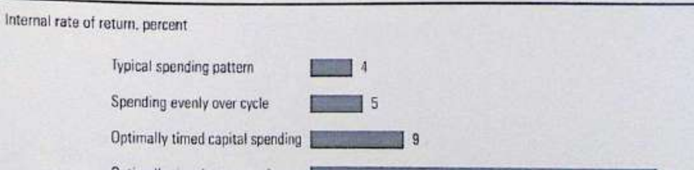
Managers who have detailed information about their product markets should be able to do a better job than the financial market in figuring out the cycle and then take appropriate actions. We can only speculate why they do not do so. Still, based on conversations with these executives, we believe that 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 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 time capital spending better. 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 35.7 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

EXHIBIT 35.7 **Relative Returns from Capital Expenditure Timing**



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.

REVIEW QUESTIONS

1. Assuming investors had perfect foresight, how would the volatility of a cyclical company's share price compare to the volatility of its profits?
2. Describe how analyst projections of cyclical company profits compare to actual performance. What are the possible reasons for the deviation?
3. Why should a scenario approach to valuation be used to value cyclical companies?
4. What are the potential reasons cyclical companies invest cyclically rather than countercyclically?

36

Valuing 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. Yet separate accounts for the different businesses are rarely available.

When you are valuing banks, the basic approach to valuing industrial companies, set out in Part Two, is the right way to start. However, if you want your valuation to reflect the complexities of today's banking businesses and to yield insights into where and how a bank is creating value, then the process of valuation becomes more complicated, as there are significant analytical challenges to overcome. This chapter provides a general overview of how to value banks and highlights some of the most common valuation challenges peculiar to banks. First we discuss the economic fundamentals of banking and trends in performance and growth. Then we describe how to use the equity cash flow approach for valuing banks, using a hypothetical, simplified example. We conclude by offering some practical recommendations for valuing universal banks in all their real-world complexity.

The authors would like to thank Bas Deelder for his contribution to this chapter.

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 in 2008. Many large institutions on either side of the Atlantic went into bankruptcy or had to be bailed out by governments. 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.

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 into failure at great speed. 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.

Modern universal banks 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 we discuss later in the 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. But not all of the income banks earn this way represents value, because it involves risks to shareholders.

Fee and Commission Income

For services including 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 Merrill Lynch) and for universal banks with large investment banking activities (UBS, Credit Suisse, 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 decade, proprietary trading has 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 has painfully illustrated. For some investment banks, including Goldman Sachs and the former Lehman Brothers, trading contributed the largest component of total net revenues in the five years before 2008.

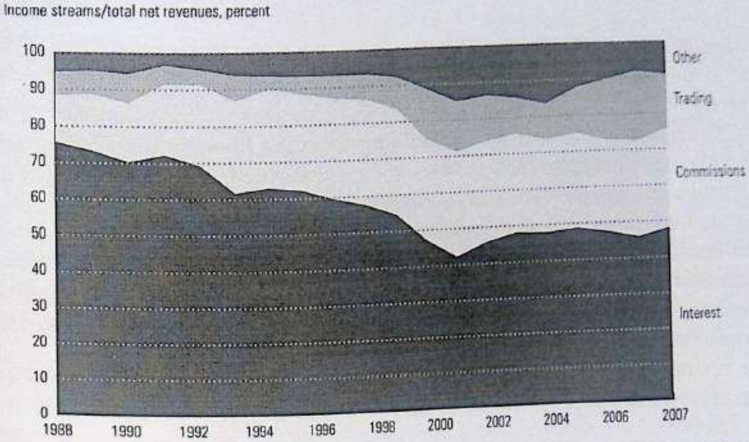
Other Income

In addition, some banks 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 banks' main banking activities.

As Exhibit 36.1 shows for the European banking sector, the relative importance of these four income sources has changed radically over the past two decades. European banks have steadily shifted away from interest income toward commission and trading income.

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 36.2). The return on equity and market-to-book ratios for the sector as a whole rose sharply after

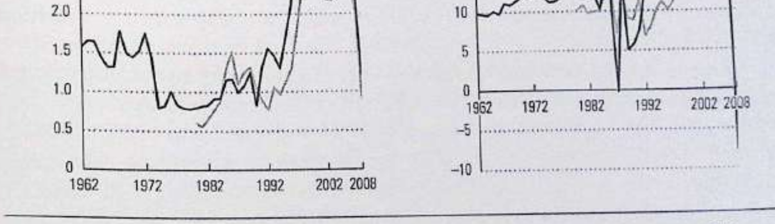
EXHIBIT 36.1 **Income Sources for European Banks,[1] 1988–2007**



[1] Based on aggregate financials and valuation of 113 European banks, of which 109 were active in 2007.

Source: Compustat, Datastream, Bloomberg.

EXHIBIT 36.2 **Increased Cyclicality in Banking**



[1] Based on aggregate financials and valuation of 113 EU banks, of which 109 were active in 2007 and 957 US banks, of which 346 were active in 2007; book value of equity excludes goodwill.

Source: Compustat, Datastream, Bloomberg

1995 to reach historic peaks in 2006. But they declined sharply during the credit crisis and by early 2010 were still far below their peak levels.

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 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. We need 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.[1] Whenever possible, you should triangulate your results by using a multiples-based valuation.

We will explain the principles of the equity DCF method using 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 36.3.

At of the start of 2009, 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 amounts to $29 million in 2009, 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. 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 we subtract taxes at 30 percent, net income equals $11 million, which translates into a return on equity of 12.2 percent.

As discussed in Chapter 6, 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:

$$V_e = \sum_{t=1}^{\infty} \frac{\text{CFE}_t}{(1+k_e)^t}$$

We can derive equity cash flow from two starting points. First, equity cash flow equals net income minus the earnings retained in the business:

$$\text{CFE}_t = \text{NI}_t - \Delta E_t + \text{OCI}_t$$

[1] See Chapter 6 for a comparison of the enterprise and equity DCF methods.

EXHIBIT 36.3 **ABC Bank: Historical Financial Statements**

$ million

	2005	2006	2007	2008	2009
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 (percent)					
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

where CFE is equity cash flow, NI is net income, ΔE is the increase in the book value of equity, and OCI is 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 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 other comprehensive income, such as net unrealized gains and losses on certain equity and debt investments, hedging activities, adjustments to the minimum

EXHIBIT 36.4 **ABC Bank: Historical Cash Flow to Equity**

$ million

	2005	2006	2007	2008	2009
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

pension liability, and foreign-currency translation items. This cancels out any noncash adjustment to equity.[2]

Exhibit 36.4 shows the equity cash flow calculation for ABC Bank. Note that in 2005, 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 2006 and 2007 because it raised new equity to lift its Tier 1 ratio from 4 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

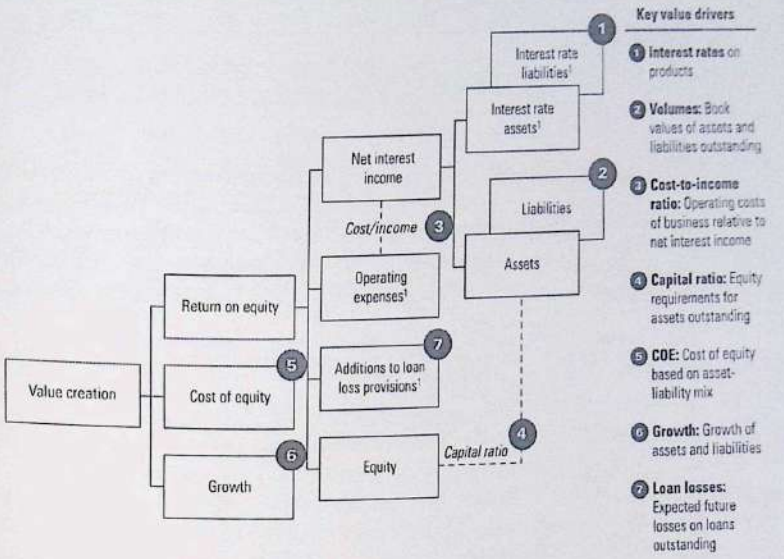
Exhibit 36.5 shows the generic value driver tree for a retail bank, which is conceptually the same as one for an industrial company. Following the tree's branches, we analyze ABC's historical performance.

Over the past five years, ABC's loan portfolio has grown by around 3.0 to 3.5 percent annually. Since 2005, ABC's interest rates on loans have been declining from 7.0 percent to 6.5 percent in 2009, 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 net interest income from $22 million in 2005 to $29 million in 2009. The bank also managed to improve its cost-to-income ratio significantly from a peak level of 53 percent in 2006 to 45 percent in 2009.

Higher regulatory requirements for equity risk capital forced ABC to double its Tier 1 ratio (equity to total assets) from 4 to 8 percent over the period. The combination of loan portfolio growth and stricter regulatory requirements has required ABC to increase its equity capital by some $50 million since 2004.

[2] 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 36.5 **Generic Value Driver Tree for Retail Banking: Equity DCF Version**



[1] After taxes

As a result, ABC's return on equity declined significantly to 12 percent in 2009 from nearly 20 percent in 2006.

Exhibit 36.6 shows the financial projections 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 2011 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).

Discounting Equity Cash Flows

To estimate the cost of equity, k_e, for ABC Bank, we use a beta of 1.27 (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:[3]

$$k_e = r_f + \beta \times \text{MRP} = 4.5\% + 1.27 \times 5.0\% = 10.85\%$$

[3] See Chapter 11 for more details on estimating the cost of capital.

EXHIBIT 36.6 **ABC Bank: Financial Forecasts**

$ million

	2010	2011	2012	2013	2014	2015
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 (percent)						
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.

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:

$$\mathrm{CV} = \frac{\mathrm{NI}\left(1 - \frac{g}{\mathrm{RONE}}\right)}{k_e - g}$$

where CV is the continuing value as of year t, NI 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,[4] its continuing value as of 2015 is as follows:

$$\mathrm{CV} = \frac{15.1\left(1 - \frac{3.5\%}{12.8\%}\right)}{10.85\% - 3.5\%} = 148.9$$

The calculation of the discounted value of ABC's cash flow to equity is presented in Exhibit 36.7. 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 ratio of 10.2. As for industrial companies, whenever possible you should triangulate your results with an analysis based on multiples (see Chapter 14). 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 10.85 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 concern the sources of value creation, the impact of leverage and business risk on the cost of equity, and the cost of 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] If the return on new equity investments (RONE) equals the return on equity (ROE), the formula can be simplified as follows:

$$\mathrm{CV} = \frac{\mathrm{NI}(1 - \frac{g}{\mathrm{ROE}})}{k_e - g} = E\left(\frac{\mathrm{ROE} - g}{k_e - g}\right)$$

where E is the book value of equity.

EXHIBIT 36.7 **ABC Bank: Valuation**

$ million

	Cash flow to equity (CFE)	Discount factor	Present value of CFE
2010	7.3	0.902	6.6
2011	8.1	0.814	6.6
2012	9.0	0.734	6.6
2013	9.9	0.662	6.5
2014	10.2	0.597	6.1
2015	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 2010 net income.

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 2009. A significant part of ABC's net interest income in 2009 is, in fact, driven by the mismatch in maturities of its short-term borrowing and long-term lending. This does not create any value.

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, 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. 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 10.85 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. In fact, 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.

Cost of holding equity risk capital Holding equity risk capital represents a key 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 riskfree bonds, everything else held 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 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.[5] We define the pretax economic spread on ABC's loan business in 2009 as the interest rate on loans minus the matched-opportunity rate (MOR) for loans, times 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.

[5] 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); J. Dermine, *Bank Valuation and Value-Based Management* (New York: McGraw-Hill, 2009).

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 that 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}), we need to deduct the taxes on the spread itself and a tax penalty on the equity required for the loan business:

$$S_{AT} = L\,(r_L - k_L)\,(1 - T) - \mathrm{TP}$$

where TP is the value of the tax penalty on equity.

The tax penalty on equity represents one of the most significant costs of running a bank. As noted already in this chapter, in contrast to deposit and debt funding, equity provides no tax shield because dividend payments are not tax deductible.[6] Thus, the more a bank relies on equity funding, 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. As a result, banks typically have to incur a tax penalty on equity funding. For ABC's loan business,[7] the tax penalty in 2009 is calculated as follows:[8]

$$\begin{aligned}\mathrm{TP} &= T \times L\,[k_L - (1 - e_L)\,k_D]\\ &= 30\%\ (\$1{,}133.7\text{ million})\,[5.1\% - (1 - 8.0\%)\,4.6\%] = \$3.0\text{ million}\end{aligned}$$

where e_L is the required equity capital divided by the amount of loans outstanding and k_D is the MOR for deposits.

The after-tax economic spread on loans is then derived as:

$$S_{AT} = \$15.9\text{ million }\ (1 - 30\%) - \$3.0\text{ million} = \$8.2\text{ million}$$

[6] Following the Modigliani-Miller theorem on the value of the levered firm, debt funding provides a tax shield, and equity funding generates a tax penalty. See also Dermine, *Bank Valuation*, 77.

[7] In case of multiple loan products, you can allocate the tax penalty to the individual product lines according to their equity capital requirements.

[8] The tax penalty corrects for the fact that the loans are partly funded with equity, for which there is no tax deductibility, and the remaining funding is not at the MOR for loans but at the MOR for deposits.

EXHIBIT 36.8 **ABC Bank: Historical Economic Spread by Product Line**

$ million

	2005	2006	2007	2008	2009
Loans interest rate (percent)	7.0	7.0	7.0	6.5	6.5
Matched-opportunity rate (MOR) (percent)	5.5	5.5	5.5	5.5	5.1
Loans relative economic spread (percent)	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 loans	(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 (percent)	5.0	4.8	4.7	4.5	4.3
Matched-opportunity rate (MOR) (percent)	5.0	4.7	4.6	4.5	4.6
Deposits spread (percent)	–	–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.

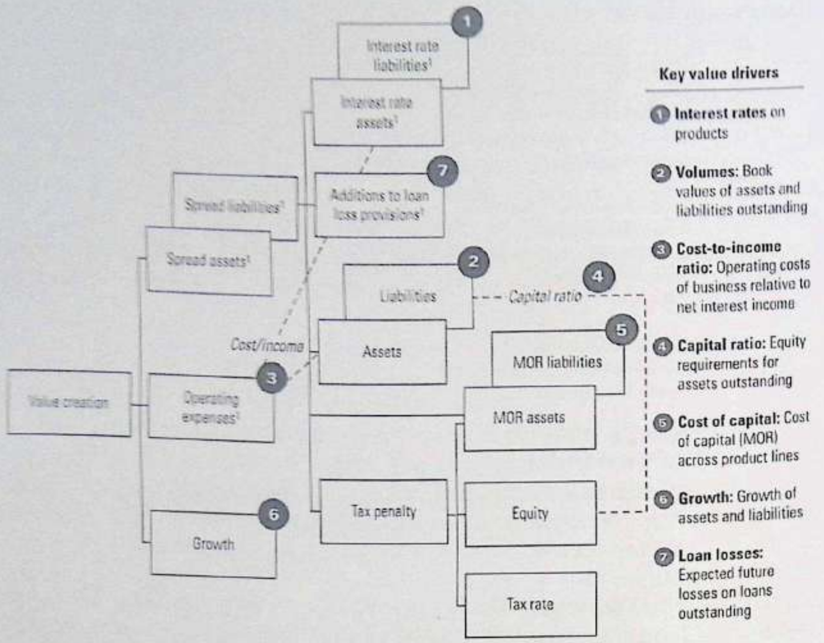
This number represents the dollar amount of value created by ABC's loan business. Along the same lines, we can define the economic spread for ABC Bank's deposit products as well (see Exhibit 36.8). Note that our analysis explicitly includes the spread on deposits because banks (in contrast to industrial companies) aim to create value in their funding operations. For example, ABC Bank is creating value for its shareholders in its deposit business in 2009 because it attracted deposits at a 4.3 percent interest rate, below the 4.6 percent rate for traded bonds with the same high credit rating as ABC.

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 2004 to 2008, as shown by the zero or negative spreads in those years.

From our calculations of the economic spreads of the two businesses, we can rearrange the value driver tree from the equity DCF approach shown previously (see Exhibit 36.9). 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).
- Changes in the capital ratio affect value creation only through the tax penalty.

EXHIBIT 36.9 **Generic Value Driver Tree for Retail Banking: Economic Spread**



[1] After taxes.

- Growth adds value only if the economic spread from the additional product sold is positive (and sufficient to cover any operating expenses).

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 versus 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 2009 net interest income after taxes of $20.2 million, only $10.3 million represents true value created (the economic spread on loans and deposits, as shown in Exhibit 36.10). The remaining

EXHIBIT 36.10 **ABC Bank: Net Interest Income and Value Creation**

$ million, 2009

	Net interest income[1]		Economic spread[1]		Mismatched-maturity charge		Matched-maturity charge
Loans	51.6		8.2		5.7		52.2
	$(L \times r_L)(1-T)$		$(1-T)L(r_L-k_L)-T(Lk_L-Dk_D)$		$L \times (k_L-k_D)$		$L \times k_D$
Deposits	(31.4)		2.2				(48.0)
	$-(D \times r_D)(1-T)$		$-(1-T)D(r_D-k_D)$				$-(D \times k_D)$
Total	20.2	=	10.3	+	5.7	+	4.2

[1] After taxes.

$9.9 million is income, but not value, because this amount is offset by the two types of charges shown in the exhibit.

The mismatched-maturity 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, that creates income. The income does not represent value when the real risks of taking positions on the yield curve are taken into account. The maturity-mismatch charge represents the component of net interest income required to compensate shareholders for that risk.

The matched-maturity charge, amounting to $4.2 million for ABC in 2009, is the income that would be required on assets and liabilities if there 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 also does not represent value: it only provides shareholders the required return on their equity investment in a perfectly matched bank.[9]

Because it provides such insights into value creation across a bank's individual product lines, we recommend using economic-spread analysis to understand a bank's performance and using the DCF model to do the valuation of the bank.

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

[9] 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.

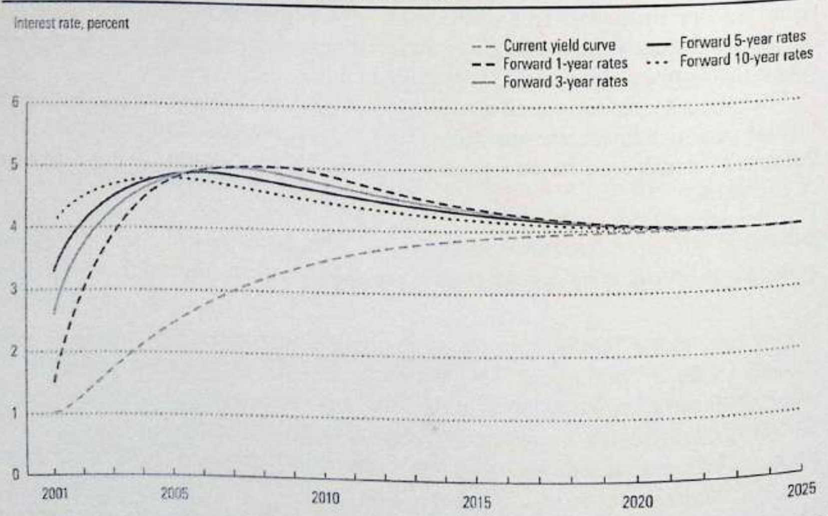
forms of straight and hybrid debt. Banks need to invest in working capital and in property, plant, and equipment, although the amounts are typically small fractions of total assets. Obviously, this variety makes the analysis of real-world banks more complex, but the principles laid out in the ABC example remain generally applicable. In this section, we discuss 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, we need to ensure that our expectations for interest rates in future years are consistent with the current yield curve.

Exhibit 36.11 shows an example of a set of future one-, three-, five-, and ten-year interest rates that are consistent with the current yield curve as of 2010. 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

EXHIBIT 36.11 **Yield Curve and Future Interest Rates**



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 2013 follows from the current three- and six-year yield:

$$r_{2013-2016} = \left[\frac{(1+Y_{2016})^6}{(1+Y_{2013})^3} - 1\right]^{1/3} = \left[\frac{(1+2.82\%)^6}{(1+1.66\%)^3} - 1\right]^{1/3} = 4.0\%$$

where $r_{2013-2016}$ is the expected three-year interest rate as of 2013 and Y_{2013} is the current three-year interest rate and Y_{2016} is the current six-year interest rate.

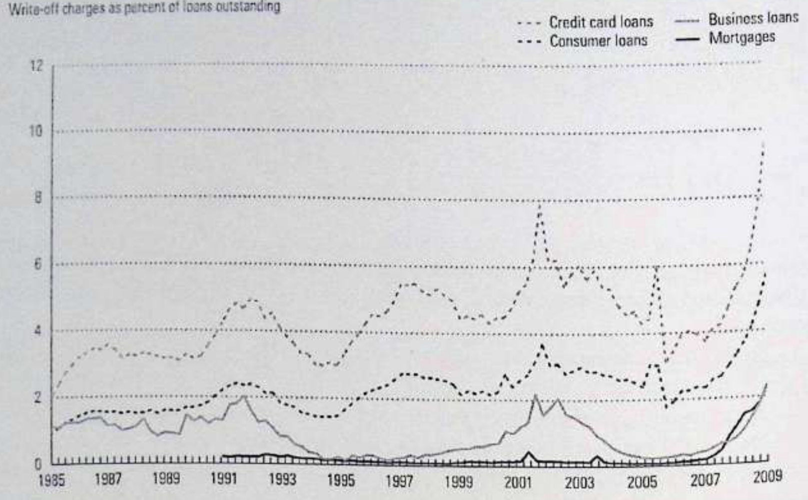
In practice, forward rate curves derived from the yield curve will rarely follow the smooth patterns of Exhibit 36.11. Small irregularities in the current yield curve can lead to large spikes and dents in the forward rate curves, which would produce large fluctuations in net interest income forecasts. 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 value drivers in retail and wholesale banking. 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 36.12). 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 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 has under- or overprovisioned for loan losses. Any required

EXHIBIT 36.12 **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.

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

Following the Basel II accords[10] implemented in 2007, banks have some flexibility to choose either internal risk models or standardized Basel approaches to assess their capital needs. All such models rest on the general principle that the amount of equity capital should be related to risk, so different types of products may require different rates of capital provision. However, banks do not publish the risk capital models that they use. Therefore, if you are doing an outside-in valuation, you need an approximation of a bank's equity risk capital needs.

To estimate a bank's equity risk capital requirements, use a percentage of risk-weighted assets (RWA). Risk-weighted assets are defined as a bank's asset portfolio weighted by the riskiness of different classes of borrowers or investments. Because banks typically provide information on total RWA but not on the risk weighting per asset category, you have to make an approximation of the key asset and investment categories' contribution to total RWA for the bank in order to project RWA and risk capital for future years.

[10] The Basel accords are recommendations on laws and regulations for banking and are issued by the Basel Committee on Banking Supervision.

EXHIBIT 36.13 **Estimating Risk-Weighted Assets (RWA) for a Large U.K. Bank**

£ billion

	Reported RWA				Estimated RWA parameters (percent)
	Year	**Asset category**	**Loans outstanding**	**RWA**	**Estimated RWA/loans**
Credit risk	2008	Loans to countries	29		20
		Loans to banks	41		35
		Loans to corporations	106		50
		Residential mortgages	115		50
		Other consumer loans	25		75
		Overall	316	150	47
	Year		**VaR trading book**	**RWA**	**Estimated RWA/ VaR**
Market risk	2007		6.32	5.3	
	2008		9.77	8.5	85
	Year		**Average revenues[1]**	**RWA**	**Estimated RWA/ average revenues[1]**
Operational risk	2007		10.8	10.1	
	2008		10.6	12.3	105

[1] Average over past 3 years

Exhibit 36.13 shows such an outside-in approximation of RWA for a large U.K.-based bank. The bank separately reports the total RWA for credit risk, market risk, and operational risk.

- To approximate the RWA for *credit risk*, you can use the risk weights from the Basel II Standardized Approach (see Exhibit 36.14) 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 (£150 billion, in this example).
- *Market risk* is a bank's exposure to changes in interest rates, stock prices, currency rates, and commodity prices and is typically related to its value at risk (VaR), which is the maximum loss for the bank under a worst-case

EXHIBIT 36.14 **Risk Weights in Basel II Standardized Approach**

percent

	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%.[1]						
Other consumer loans	Risk weighting of 75%						

[1] E.g., in the United Kingdom, the Financial Services Authority (FSA) sets cutoff point for 35% weighting at 80% loan-to-value ratio.

scenario of a given probability for these market prices. Use the reported VaR over several years to estimate the bank's RWA as a percentage of VaR (85 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 years to estimate RWA per unit of revenue (105 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 risk-weighted assets in each future year.

The 1988 Basel I accord established rules for banks regarding how much capital they must hold based on their level of risk-weighted assets. Basel I set the required ratio of Tier 1 capital to RWA at 4 percent, but many banks nowadays target around 10 percent of RWA, anticipating new regulations and increased investor requirements, as risks in the sector have increased since the credit crisis. Using your RWA forecasts and the targeted Tier 1 capital ratio, you can estimate the required Tier 1 capital. From the projected Tier 1 capital requirements, you can estimate the implied shareholders' equity requirements by applying an average historical ratio of Tier 1 capital to shareholders' equity excluding goodwill. 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.

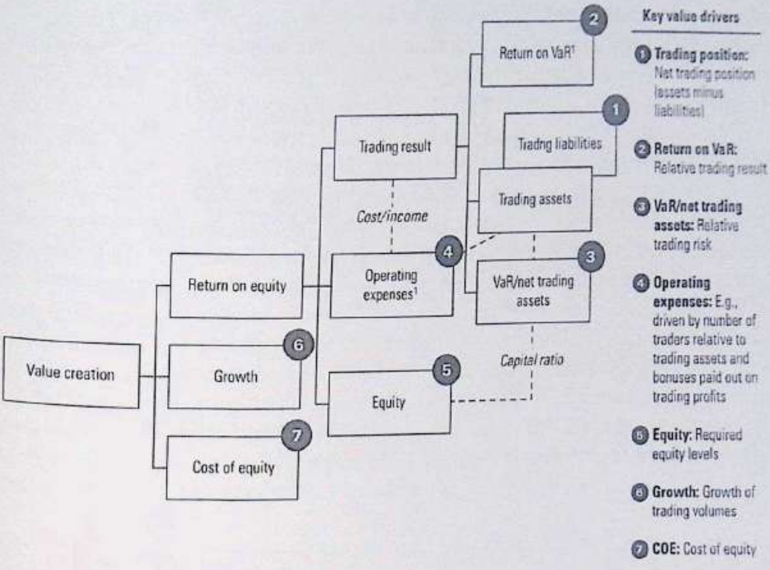
Currently, discussions are under way on new Basel III rules that build on lessons learned since the onset of the 2007 credit crisis. Although the precise outcomes of these discussions are still not clear, they are expected to include increased requirements for Tier 1 capital ratios and increased risk weightings for products and activities such as proprietary trading.

Multibusiness Banks

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 13. 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 13.

Interest-generating activities Retail banking, credit card services, and wholesale lending generate interest income from large asset positions and risk capital.

EXHIBIT 36.15 **Value Drivers: Trading Activities (Simplified)**



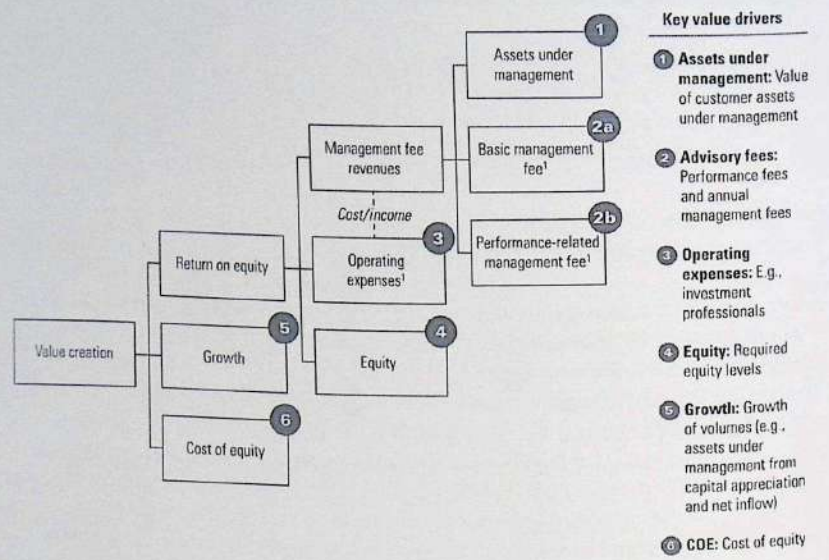
[1] After taxes.

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 36.15, 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 value at risk or 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 for the trading activities follows from the VaR (and RWA), as discussed

EXHIBIT 36.16 **Value Drivers: Asset Management (Simplified)**



[1] After taxes.

earlier in the chapter. Operating expenses, which include 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, being 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 36.16 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.

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 any maturity mismatch and capital charge. 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.

REVIEW QUESTIONS

1. Why should you estimate the value of a bank by employing the equity cash flow method when throughout the text the enterprise DCF models have been stressed?
2. Identify the value drivers embedded in the equity cash flow model. How do the equity cash flow drivers differ from the drivers of the enterprise DCF models?
3. Define *maturity mismatch*. Why is maturity mismatch important for understanding a bank's risk and analyzing its performance?
4. If a bank increases its maturity mismatch, what happens to its economic spread before taxes and its economic spread after taxes (i.e., including the tax penalty)?
5. If a bank attracts new equity to increase its Tier 1 capital ratio, what happens to its cost of equity and its intrinsic value if it invests the new equity capital in (1) deposits with the central bank, or (2) a broad equity market index?
6. Consider a large banking group with businesses in retail banking, equity trading, and mergers and acquisitions (M&A) advisory. Discuss its potential for creating value based on the possible underlying sources of competitive advantage for each of these three business areas.

7. In a bank valuation, the amount of current loan loss provision is not deducted from the DCF result. Why is it then important to analyze the adequacy of the bank's current loan loss provisions?
8. In the economic spread analysis, a tax penalty is allocated to a bank's interest spread on loans but no tax credit is allocated to the interest spread on deposits. Why does that not violate the Modigliani and Miller theorem?

APPENDIX A

Economic Profit and the Key Value Driver Formula

In Chapter 2, we converted 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
g = growth in NOPLAT and free cash flow
WACC = weighted average cost of capital

into the key value driver formula:

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

where $\text{NOPLAT}_{t=1}$ = 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 economic profit. A more general (and more technical) proof of their equivalence is provided in Appendix B. The economic-profit key value driver formula is necessary for estimating continuing value in economic-profit models.

By definition, invested capital times return on invested capital (ROIC) equals NOPLAT at time 1. Thus, we replace NOPLAT with invested capital times ROIC:

$$V = \frac{\text{Invested Capital}_0 \times \text{ROIC} \times \left(1 - \frac{g}{\text{RONIC}}\right)}{\text{WACC} - g}$$

If we assume that the return on new invested capital (RONIC) equals the return on existing invested capital (ROIC), we can simplify the preceding equation by distributing ROIC in the numerator:

$$V = \text{Invested Capital}_0 \left(\frac{\text{ROIC} - g}{\text{WACC} - g}\right)$$

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 flow. 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.

To complete the transformation to economic profit, we next add and subtract WACC in the numerator:

$$V = \text{Invested Capital}_0 \left(\frac{\text{ROIC} - \text{WACC} + \text{WACC} - g}{\text{WACC} - g}\right)$$

We separate the fraction into two components and then simplify:

$$V = \text{Invested Capital}_0 \left(\frac{\text{ROIC} - \text{WACC}}{\text{WACC} - g}\right) + \text{Invested Capital}_0 \left(\frac{\text{WACC} - g}{\text{WACC} - g}\right)$$

$$= \text{Invested Capital}_0 + \frac{\text{Invested Capital}_0(\text{ROIC} - \text{WACC})}{\text{WACC} - g}$$

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.

APPENDIX B

Discounted Economic Profit Equals Discounted Free Cash Flow

In this appendix, we provide a generalized proof of the equivalence between discounted cash flow and discounted economic profit. A less technical but specialized proof of equivalence is demonstrated using the key value driver formula in Appendix A.

To prove equivalence, start by computing the present value of a periodic stream of cash flow:

$$V = \sum_{t=1}^{\infty} \frac{\text{FCF}_t}{(1+\text{WACC})^t}$$

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 using 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, 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:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\mathrm{IC}_t}{(1+\mathrm{WACC})^t} - \sum_{t=1}^{\infty} \frac{\mathrm{IC}_{t-1}}{(1+\mathrm{WACC})^{t-1}} + \sum_{t=1}^{\infty} \frac{\mathrm{FCF}_t}{(1+\mathrm{WACC})^t}$$

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 of invested capital:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\mathrm{IC}_t}{(1+\mathrm{WACC})^t} - \sum_{t=1}^{\infty} \frac{(1+\mathrm{WACC})\mathrm{IC}_{t-1}}{(1+\mathrm{WACC})^t} + \sum_{t=1}^{\infty} \frac{\mathrm{NOPLAT}_t - (\mathrm{IC}_t - \mathrm{IC}_{t-1})}{(1+\mathrm{WACC})^t}$$

Because there is now a consistent denominator across all three cumulative sums, combine them into a single cumulative sum:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\mathrm{IC}_t - (1+\mathrm{WACC})\mathrm{IC}_{t-1} + \mathrm{NOPLAT}_t - \mathrm{IC}_t + \mathrm{IC}_{t-1}}{(1+\mathrm{WACC})^t}$$

In the second term of the numerator, distribute $(1+\mathrm{WACC})\mathrm{IC}_{t-1}$ into its two components, IC_{t-1} and $\mathrm{WACC}(\mathrm{IC}_{t-1})$:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\mathrm{IC}_t - \mathrm{IC}_{t-1} - \mathrm{WACC}(\mathrm{IC}_{t-1}) + \mathrm{NOPLAT}_t - \mathrm{IC}_t + \mathrm{IC}_{t-1}}{(1+\mathrm{WACC})^t}$$

Simplify by collecting terms:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\mathrm{NOPLAT}_t - \mathrm{WACC}(\mathrm{IC}_{t-1})}{(1+\mathrm{WACC})^t}$$

The numerator is the definition of economic profit, so the result is a valuation based on economic profit:

$$V = \mathrm{IC}_0 + \sum_{t=1}^{\infty} \frac{\text{Economic Profit}_t}{(1+\mathrm{WACC})^t}$$

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 desire (and 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 C

Derivation of Free Cash Flow, Weighted Average Cost of Capital, and Adjusted Present Value

In Chapter 6, we numerically demonstrate 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. In this appendix, we derive the key terms in each model—namely, free cash flow (FCF) and the weighted average cost of capital (WACC)—and demonstrate 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):

$$V = (D + E)\left(\frac{D(1 - T_m)k_d + \text{CF}_e - D(g)}{D(1 - T_m)k_d + \text{CF}_e - D(g)}\right) \tag{C.1}$$

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:

$$\text{FCF} = D(1 - T_m)k_d + \text{CF}_e - D(g)$$

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,

$$\text{FCF} = \text{Interest}(1 - T_m) + \text{CF}_e - D(g)$$

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:

$$\begin{aligned}\text{FCF} = {} & \text{Interest}(1 - T_m) + \text{EBIT} - \text{Interest} - \text{Taxes} - \text{Net Investment} \\ & + D(g) - D(g)\end{aligned}$$

Next, distribute the after-tax interest expression into its two components, and cancel $D(g)$:

$$\text{FCF} = \text{Interest} - T_m(\text{Interest}) + \text{EBIT} - \text{Interest} - \text{Taxes} - \text{Net Investment}$$

Simplify by canceling the interest terms and rearranging the remaining terms:

$$\text{FCF} = \text{EBIT} - [\text{Taxes} + T_m\,(\text{Interest})] - \text{Net Investment}$$

In Chapter 6, we define 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, we focus on the denominator. To derive the weighted average cost of capital (WACC), start with equation C.1, and multiply CF_e by $k_e - g$ divided by $k_e - g$ (which equals 1):

$$V = (D + E)\left(\frac{\text{FCF}}{D(1 - T_m)k_d + \dfrac{\text{CF}_e}{k_e - g}(k_e - g) - D(g)}\right)$$

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 C.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 market-based values, and not book values, should be used to build the cost of capital. This is also why free cash flow should be discounted 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 $(D + E)/(D + E)$:

$$V = \frac{D\,(k_d) + \text{CF}_e - D(g)}{\frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) - g}$$

In Appendix D, we show that if the company's interest tax shields have the same risk as the company's operating assets (as we would expect when the company maintains a constant capital structure), the fraction's denominator

[2] To see this restriction applied in a more general setting, see Miles and Ezzell, "Weighted Average Cost of Capital."

equals k_u, the unlevered cost of equity, minus the growth in cash flow (g). Make this substitution into the previous equation:

$$V = \frac{D(k_d) + CF_e - D(g)}{k_u - g}$$

Next, we 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 D

Levering and Unlevering the Cost of Equity

In Chapter 6, we value a company using adjusted present value (APV). One key input for APV is the unlevered cost of equity. In this appendix, we derive various formulas that can be used to compute the unlevered cost of equity under different assumptions.

Chapter 10 details 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. We discuss both in this appendix.

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):

$$V_u + V_{txa} = \text{Enterprise Value} = D + E \tag{D.1}$$

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:

$$\frac{V_u}{V_u + V_{txa}}(k_u) + \frac{V_{txa}}{V_u + V_{txa}}(k_{txa}) = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) \tag{D.2}$$

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, we must 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, we must therefore 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:

$$k_u = \frac{D}{D+E}(k_d) + \frac{E}{D+E}(k_e) \tag{D.3}$$

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 D.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 D.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 D.1 to $V_u = D - V_{txa} + E$, and divide both sides by this value:

$$k_u = \frac{D - V_{txa}}{D - V_{txa} + E}(k_d) + \frac{E}{D - V_{txa} + E}(k_e) \tag{D.4}$$

Equation D.4 mirrors equation D.2 closely. It differs from equation D.2 only in that the market value of debt is reduced by the present value of expected tax shields.

Exhibit D.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 general formula (in the bottom left corner) is replaced with $D(T_m)$. The equation is simplified by combining D within the parentheses.

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 D.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 D.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:

$$k_e = \frac{D}{E}(k_u) - \frac{V_{txa}}{E}(k_u) + k_u - \frac{D}{E}(k_d) + \frac{V_{txa}}{E}(k_{txa}) \tag{D.5}$$

Consolidating terms and rearranging leads to the *general equation* for the cost of equity:

$$k_e = k_u + \frac{D}{E}(k_u - k_d) - \frac{V_{txa}}{E}(k_u - k_{txa}) \tag{D.6}$$

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.

Levered Cost of Equity When k_{txa} Equals k_d

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 D.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, we 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 D.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 D.2 **Levered Cost of Equity**

	Dollar level of debt fluctuates	Dollar level of debt is constant
Tax shields have same risk as operating assets $k_{txa} = k_u$	$k_e = k_u + \frac{D}{E}\left(k_u - k_d\right)$	$k_e = k_u + \frac{D}{E}\left(k_u - k_d\right)$
Tax shields have same risk as debt $k_{txa} = k_d$	$k_e = k_u + \frac{D - V_{txa}}{E}\left(k_u - k_d\right)$	$k_e = k_u + \left(1 - T_m\right)\frac{D}{E}\left(k_u - k_d\right)$

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

Similar 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:

$$\frac{V_u}{V_u + V_{txa}}(\beta_u) + \frac{V_{txa}}{V_u + V_{txa}}(\beta_{txa}) = \frac{\mathrm{D}}{\mathrm{D} + \mathrm{E}}(\beta_d) + \frac{\mathrm{E}}{\mathrm{D} + \mathrm{E}}(\beta_e)$$

Since the form of this equation is identical to the cost of capital, we can rearrange the formula using the same process as previously described. Rather than repeat the analysis, we provide a summary of levered beta in Exhibit D.3. As expected, the first two columns are identical in form to Exhibit D.2, except that the beta (β) replaces the cost of capital (k).

By using beta, we can 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):

$$\beta_e = \beta_u + \frac{D}{\mathrm{E}}(\beta_u - \beta_d)$$

into the following:

$$\beta_e = \left(1 + \frac{D}{\mathrm{E}}\right)\beta_u$$

EXHIBIT D.3 **Levered Beta**

	Dollar level of debt fluctuates	Dollar level of debt is constant and debt is risky	Debt is risk free[1]
Tax shields have same risk as operating assets $\beta_{txa} = \beta_u$	$\beta_e = \beta_u + \frac{D}{E}(\beta_u - \beta_d)$	$\beta_e = \beta_u + \frac{D}{E}(\beta_u - \beta_d)$	$\beta_e = \left(1 + \frac{D}{E}\right)\beta_u$
Tax shields have same risk as debt $\beta_{txa} = \beta_d$	$\beta_e = \beta_u + \frac{D - V_{txa}}{E}(\beta_u - \beta_d)$	$\beta_e = \beta_u + (1 - T_m)\frac{D}{E}(\beta_u - \beta_d)$	$\beta_e = \left[1 + (1 - T_m)\frac{D}{E}\right]\beta_u$

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

[1] When $\beta_{txa} = \beta_u$, the resulting formula holds for all debt patterns, not just constant debt.

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 E

Leverage and the Price-to-Earnings Multiple

This appendix demonstrates that the price-to-earnings (P/E) ratio 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 ratio 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

To determine the relationship between P/E and leverage, we 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:

$$\text{PE}_u = \frac{V_{ENT}}{\text{NOPLAT}_{t+1}}$$

where V_{ENT} = enterprise value
NOPLAT_{t+1} = net operating profit less adjusted taxes in year $t+1$

This equation can be rearranged to solve for the enterprise value, which we will use in the next step:

$$V_{ENT} = \text{NOPLAT}_{t+1}\,(\text{PE}_u) \tag{E.1}$$

STEP 2

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, the company's 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:

$$\mathrm{NI}_{t+1} = \mathrm{NOPLAT}_{t+1} - V_{ENT}\left(\frac{D}{V}\right)k_d$$

Substitute equation E.1 for the enterprise value:

$$\mathrm{NI}_{t+1} = \mathrm{NOPLAT}_{t+1} - \mathrm{NOPLAT}_{t+1}(\mathrm{PE}_u)\left(\frac{D}{V}\right)k_d$$

Factor NOPLAT into a single term:

$$\mathrm{NI}_{t+1} = \mathrm{NOPLAT}_{t+1}\left[1 - \mathrm{PE}_u\left(\frac{D}{V}\right)k_d\right] \tag{E.2}$$

STEP 3

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 E.1:

$$V_{ENT} = \mathrm{NOPLAT}_{t+1}(\mathrm{PE}_u)$$

To convert enterprise value into equity value, multiply both sides by 1 minus the debt-to-value ratio:

$$V_{ENT}\left(1 - \frac{D}{V_{ENT}}\right) = \mathrm{NOPLAT}_{t+1}(\mathrm{PE}_u)\left(1 - \frac{D}{V_{ENT}}\right)$$

Distribute V_{ENT} into the parentheses:

$$V_{ENT} - D = \mathrm{NOPLAT}_{t+1}(\mathrm{PE}_u)\left(1 - \frac{D}{V_{ENT}}\right)$$

and replace enterprise value (V_{ENT}) minus debt (D) with equity value (E):

$$E = \mathrm{NOPLAT}_{t+1}(\mathrm{PE}_u)\left(1 - \frac{D}{V_{ENT}}\right)$$

Next, use equation E.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:

$$\frac{\text{E}}{\text{NI}_{t+1}} = \frac{[\text{PE}_u\,(k_d) - 1] + \left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]}{k_\text{d}\left[1 - \text{PE}_u\left(\frac{D}{V}\right)(k_d)\right]}$$

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:

$$\frac{E}{\mathrm{NI}_{t+1}} = \frac{1}{k_d} + \frac{\mathrm{PE}_u - \dfrac{1}{k_d}}{1 - \mathrm{PE}_u\left(\dfrac{D}{V}\right)(k_d)}$$

Finally, multiply the numerator and denominator of the second term by −1:

$$\frac{E}{\mathrm{NI}_{t+1}} = \frac{1}{k_d} + \frac{\dfrac{1}{k_d} - \mathrm{PE}_u}{\left(\dfrac{D}{V}\right)k_d(\mathrm{PE}_u) - 1}$$

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.

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VALUATION

MEASURING AND MANAGING THE VALUE OF COMPANIES

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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 20 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 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 the past 20 years, 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.

WHY THIS BOOK

Not all CEOs, business managers, and financial managers *do* understand value in great depth, 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, its practical intent reflecting 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 that 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 underlinings, margin notations, and highlightings.

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. And these two truths apply across time and geography. The book explains why these core principles of value creation are true and how companies can increase value by applying the principles to decisions, and demonstrates practical ways to implement the principles in their decision-making.

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 an organization's various parts to create value.
- Communicate effectively with investors, including both who to talk 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 fifth 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 despite the capital market turmoil of the past several years. We explain the two core principles of value creation: first, the idea that return on capital and growth drive cash flow, which in turn drives value, and second, the conservation of value principle, 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. A 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, **Intrinsic Value and the Stock Market**, presents the empirical evidence that share prices reflect the core principles of value creation and are not influenced by earnings management, accounting results, or institutional trading factors such as cross-listings. It also describes the rare circumstances under which share prices for individual companies or, very occasionally, the market in general may temporarily violate the core principles. The final chapter explains what makes stock markets efficient, which type of investors ultimately determine the trading range of a company's share price, and the implications of their influence for managers.

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

Part Six, **Special Situations**, is devoted to valuation in more complex contexts. We explore the challenges of valuing high-growth companies, companies in emerging markets, cyclical companies, and banks. In addition, we show how uncertainty and flexibility affect value, and how to apply option pricing theory and decision trees in valuations.

WHAT'S NEW ABOUT THE FIFTH EDITION

Most of the case examples and empirical analyses have been updated, and we have reflected changes in accounting rules. We have enhanced the global perspective in the book with extensive examples and data from both the United States and Europe.

To make the book easier to navigate, we have broken up long chapters from the previous edition into several shorter chapters, so that each is a more manageable size and the reader can find important topics faster. In addition, we have created a new part on advanced valuation issues, removing these topics from the section dedicated to core techniques. This makes the core techniques section shorter and easier to read and also allows us more space to devote to advanced topics.

An important addition to the book is the expanded discussion of return on invested capital (ROIC) and growth in two new chapters in Part One. The new ROIC chapter shows the linkages between different levels of ROIC and different business strategies, to help executives assess whether their strategies can lead to high and sustained returns on capital. In the new growth chapter, we show the different effects on value of different types of growth, to help companies prioritize growth initiatives.

Finally, Part Three is an entirely new section that deals with the stock market. As in past editions, we show that stock market values generally reflect companies' fundamental economic performance: markets are not fooled by accounting gimmicks used to embellish results. For the fifth edition, however, we have expanded our discussion of those market inefficiencies that do occur from time to time. We also present new insights on how to segment investors into different types, how the different types of investors affect the market, and the implications of this segmentation for executives.

VALUATION SPREADSHEET

An Excel spreadsheet valuation model is available on a CD-ROM or 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 on CD-ROM (ISBN 978-0-470-42457-5), please call (800) 225-5945, or visit www.wileyvaluation.com to purchase the model via Web download (ISBN 978-0-470-89455-2).

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.

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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.

Concurrent with this fifth edition, McKinsey is publishing 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 to valuation. We've greatly benefited from the ideas of that book's co-authors, Richard Dobbs and Bill Huyett, as well as the lead editor, Neil DeCarlo.

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Gina Campbell, our lead editor, ensured that our ideas were expressed clearly and concisely. She also had to cope with our difficult schedules, which she handled gracefully. Thank you, Gina. Karen Schenkenfelder provided careful editing and feedback throughout the process. We are indebted to her excellent eye for detail. Kim Bartko oversaw the production of the more than 300 exhibits in this book, a Herculean task given the variety of formats and technologies employed. We are also grateful to Joseph Mandel for his painstaking help with final fact-checking.

Bill Javetski and Rik Kirkland ensured that we received superior editorial support from McKinsey's external publishing team.

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.

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