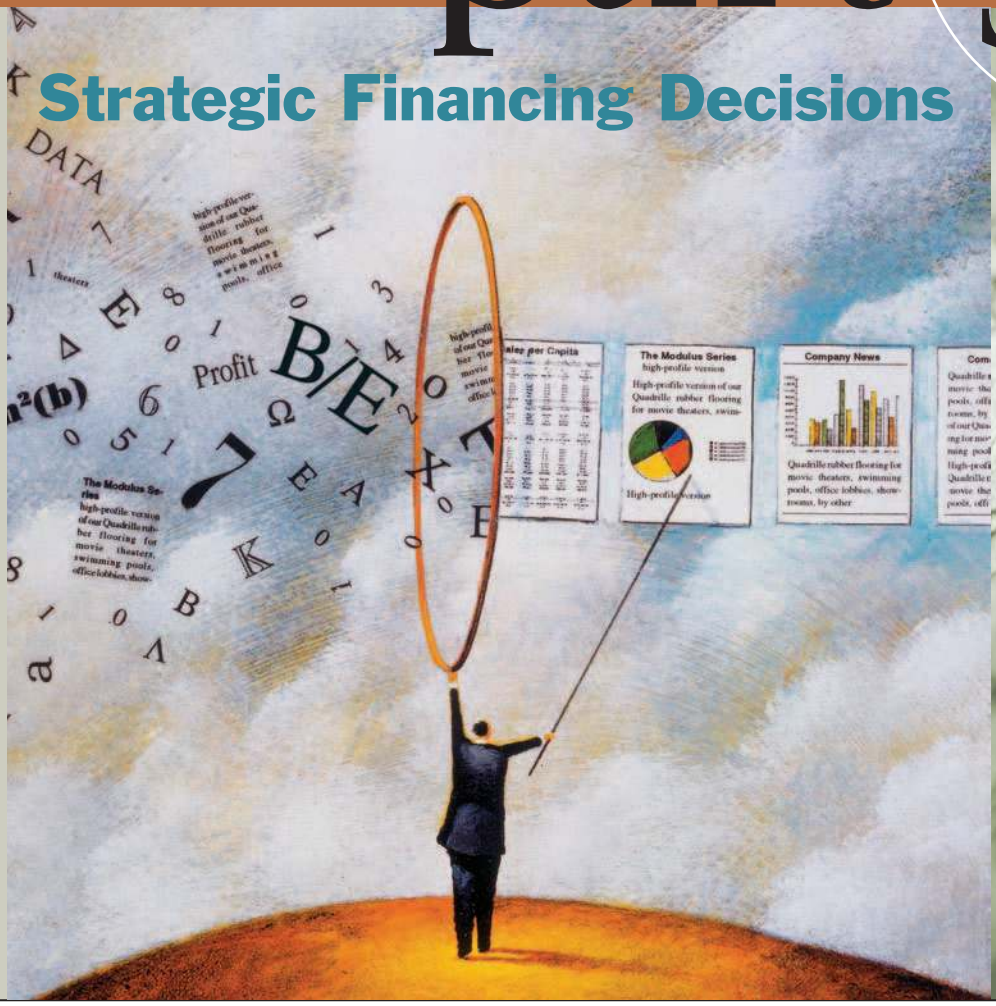
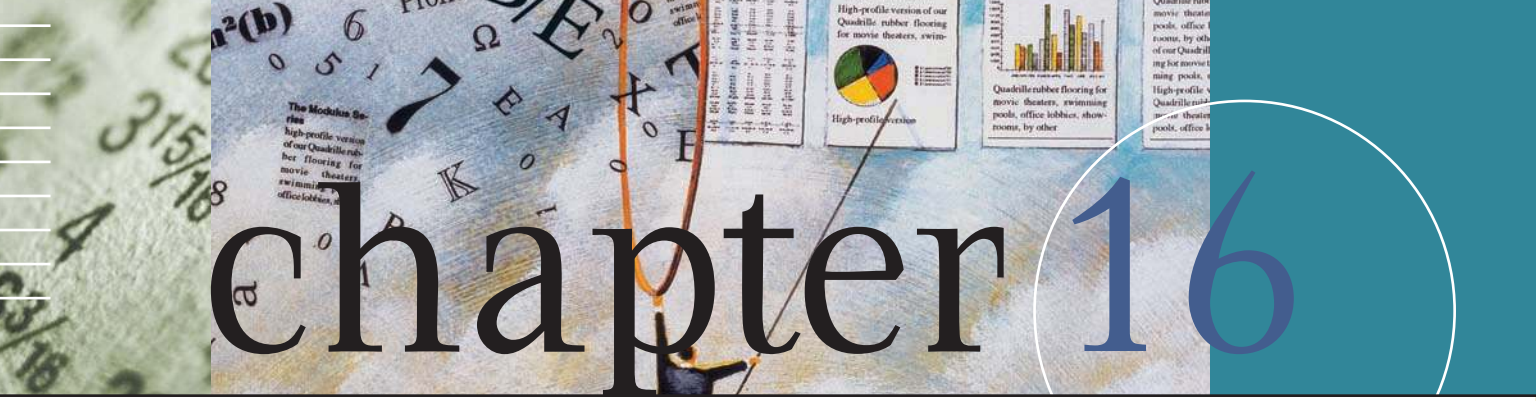
part 5

Strategic Financing Decisions





chapter 16

Capital Structure Decisions: The Basics

A company can obtain long-term financing in the form of equity, debt, or some combination. The accompanying table shows the long-term debt ratios for different business sectors, along with selected individual companies within those sectors. There are obvious differences between sectors' average debt ratios, with Technology having a very low average ratio (17%) and others, such as Utilities (60%), having much higher ratios. But notice that within each sector some companies have very low levels of debt, while others have very high levels. For example, the average debt ratio for Consumer/Noncyclical is 45%, but Starbucks has no long-term debt whereas Kellogg has 59%. Why do we see such variation across companies and business sectors, and can a company make itself more valuable through its choice of debt ratio? Keep these questions in mind as you read this chapter.

For updates on a company's ratio, go to **http://www.reuters.com** and enter the ticker symbol for a stock quote. Click on Ratios (on the left) for updates on the sector ratio. The long-term debt ratio in the table is the percent of long-term financing that comes from debt: (Long-term debt)/(Long-term debt + Equity).

Sector and Company	Long-Term Debt Ratio	Sector and Company	Long-Term Debt Ratio
Technology	**17%**	**Consumer/Noncyclical**	**45%**
Intuit Inc. (INTU)	0	Starbucks Corporation (SBUX)	0
IKON Office Solutions (IKN)	32	Kellogg Company (K)	59
Energy	**25**	**Conglomerates**	**60**
ExxonMobil Corporation (XOM)	6	Minnesota Mining & Mfg. (MMM)	10
Chesapeake Energy Corp. (CHK)	46	Olin Corp. (OLN)	36
Health Care	**26**	**Utilities**	**60**
Patterson Dental Company (PDCO)	15	Reliant Energy Inc. (RRI)	54
HCA Inc. (HCA)	70	CMS Energy Corporation (CMS)	73
Transportation	**37**	**Services**	**45**
United Parcel Service (UPS)	15	Administaff Inc. (ASF)	14
Continental Airlines Inc. (CAL)	89	Allied Waste Industries (AW)	67

(*Continued*)

Sector and Company	Long-Term Debt Ratio	Sector and Company	Long-Term Debt Ratio
Basic Materials	**42**	**Consumer Cyclical**	**57**
Anglo American PLC (AAUK)	21	Callaway Golf Company (ELY)	0
Century Aluminum Company (CENX)	89	Black & Decker Corp. (BDK)	37
Capital Goods	**41**		
Winnebago Industries (WGO)	0		
Caterpillar Inc. (CAT)	76		

As we saw in Chapters 14 and 15, all firms need operating capital to support their sales. To acquire that operating capital, funds must be raised, usually as a combination of equity and debt. The firm's mixture of debt and equity is called its **capital structure.** Although actual levels of debt and equity may vary somewhat over time, most firms try to keep their financing mix close to a **target capital structure.** A firm's **capital structure decision** includes its choice of a target capital structure, the average maturity of its debt, and the specific types of financing it decides to use at any particular time. As with operating decisions, managers should make capital structure decisions designed to maximize the firm's value.

e-resource

The textbook's Web site contains an *Excel* file that will guide you through the chapter's calculations. The file for this chapter is ***FM12 Ch 16 Tool Kit.xls***, and we encourage you to open the file and follow along as you read the chapter.

16.1 A Preview of Capital Structure Issues

Recall from Chapter 15 that the value of a firm's operations is the present value of its expected future free cash flows (FCF), discounted at its weighted average cost of capital (WACC):

$$V_{op} = \sum_{t=1}^{\infty} \frac{FCF_t}{(1 + WACC)^t}. \qquad (16\text{-}1)$$

The WACC depends on the percentages of debt and equity (w_d and w_{ce}), the cost of debt (r_d), the cost of stock (r_s), and the corporate tax rate (T):

$$WACC = w_d(1 - T)r_d + w_{ce}r_s. \qquad (16\text{-}2)$$

As these equations show, the only way any decision can change a firm's value is by affecting either free cash flows or the cost of capital. We discuss below some of the ways that a higher proportion of debt can affect WACC and/or FCF.

Corporate Valuation and Capital Structure

A firm's financing choices obviously have a direct effect on its weighted average cost of capital (WACC). Financing choices also have an indirect effect because they change the risk and required return of debt and equity. This chapter focuses on the debt–equity choice and its effect on value.

$$\text{Value} = \frac{FCF_1}{(1 + WACC)^1} + \frac{FCF_2}{(1 + WACC)^2} + \frac{FCF_3}{(1 + WACC)^3} + \cdots + \frac{FCF_\infty}{(1 + WACC)^\infty}$$

Debt Increases the Cost of Stock, r_s

Debtholders have a prior claim on the company's cash flows relative to shareholders, who are entitled only to any residual cash flow after debtholders have been paid. As we show later in a numerical example, the "fixed" claim of the debtholders causes the "residual" claim of the stockholders to become less certain, and this increases the cost of stock, r_s.

Debt Reduces the Taxes a Company Pays

Imagine that a company's cash flows are a pie, and three different groups get pieces of the pie. The first piece goes to the government in the form of taxes, the second goes to debtholders, and the third to shareholders. Companies can deduct interest expenses when calculating taxable income, which reduces the government's piece of the pie and leaves more pie available to debtholders and investors. This reduction in taxes reduces the after-tax cost of debt, as shown in Equation 16-2.

The Risk of Bankruptcy Increases the Cost of Debt, r_d

As debt increases, the probability of financial distress, or even bankruptcy, goes up. With higher bankruptcy risk, debtholders will insist on a higher promised return, which increases the pre-tax cost of debt, r_d.

The Net Effect on the Weighted Average Cost of Capital

As Equation 16-2 shows, the WACC is a weighted average of relatively low-cost debt and high-cost equity. If we increase the proportion of debt, then the weight of low-cost debt (w_d) increases and the weight of high-cost equity (w_{ce}) decreases. If all else remained the same, then the WACC would fall and the value of the firm in Equation 16-1 would increase. But the previous paragraphs show that all else doesn't remain the same: both r_d and r_s increase. While it should be clear that changing the capital structure affects all the variables in the WACC equation, it's not easy to say whether those changes increase the WACC, decrease it, or balance out exactly and leave the WACC unchanged. We'll return to this issue later, when we discuss capital structure theory.

Bankruptcy Risk Reduces Free Cash Flow

As the risk of bankruptcy increases, some customers may choose to buy from another company, which hurts sales. This, in turn, decreases net operating profit after taxes (NOPAT), thus reducing FCF. Financial distress also hurts the productivity of workers and managers, as they spend more time worrying about their next job rather than their current job. Again, this reduces NOPAT and FCF. Finally, suppliers tighten their credit standards, which reduces accounts payable and causes net operating working capital to increase, thus reducing FCF. Therefore, the risk of bankruptcy can decrease FCF and reduce the value of the firm.

Bankruptcy Risk Affects Agency Costs

Higher levels of debt may affect the behavior of managers in two opposing ways. First, when times are good, managers may waste cash flow on perquisites and unnecessary expenditures. This is an agency cost, as described in Chapter 15. The good news is that the threat of bankruptcy reduces such wasteful spending, which increases FCF.

But the bad news is that a manager may become gun-shy and reject positive NPV projects if they are risky. From the stockholder's point of view it would be unfortunate if a risky project caused the company to go into bankruptcy, but note that other companies in the stockholder's portfolio may be taking on risky projects that turn out to be successful. Since most stockholders are well diversified, they can afford for a manager to take on risky but positive NPV projects. But a manager's reputation and wealth are generally tied to a single company, so the project may be unacceptably risky from the manager's point of view. Thus, high debt can cause managers to forgo positive NPV projects unless they are extremely safe. This is called the **underinvestment problem,** and it is another type of agency cost. Notice that debt can reduce one aspect of agency costs (wasteful spending) but may increase another (underinvestment), so the net effect on value isn't clear.

Issuing Equity Conveys a Signal to the Marketplace

Managers are in a better position to forecast a company's free cash flow than are investors, and academics call this **informational asymmetry.** Suppose a company's stock price is $50 per share. If managers are willing to issue new stock at $50 per share, investors reason that no one would sell anything for less than its true value. Therefore, the true value of the shares as seen by the managers with their superior information must be less than or equal to $50. Thus, investors perceive an equity issue as a negative signal, and this usually causes the stock price to fall.[1]

SELF-TEST Briefly describe some ways in which the capital structure decision can affect the WACC and FCF.

16.2 Business Risk and Financial Risk

In Chapter 6, when we examined risk from the viewpoint of a stock investor, we distinguished between *market risk*, which is measured by the firm's beta coefficient,

[1]An exception to this rule is any situation with little informational asymmetry, such as a regulated utility. Also, some companies, such as start-ups or high-tech ventures, are unable to find willing lenders and therefore must issue equity; we discuss this later in the chapter.

and *stand-alone risk*, which includes both market risk and an element of risk that can be eliminated by diversification. Now we introduce two new dimensions of risk: (1) *business risk*, or the risk of the firm's stock if it uses no debt, and (2) *financial risk*, which is the additional risk placed on the common stockholders as a result of the firm's decision to use debt.[2]

Conceptually, each firm has a certain amount of risk inherent in its operations—this is its business risk. If it uses any debt, then in effect it is partitioning its investors into two groups and concentrating its business risk on one class—the common stockholders. The additional risk the stockholders of a levered firm face, over the risk they would face if the firm used no debt, is the firm's financial risk. For example, if half of a firm's capital is raised as debt and half as common equity, then each common stockholder would bear about twice as much risk as if only equity were used. Naturally, a levered firm's stockholders will demand more compensation for bearing the additional (financial) risk, so the required rate of return on common equity will increase with the use of debt. *In other words, the greater the use of debt, the greater the concentration of risk on the stockholders, and the higher the cost of common equity*. In the balance of this section, we examine business and financial risk within a stand-alone risk framework, which ignores the effects of diversification. Later, we analyze the effects of diversification.

Business Risk

As noted above, **business risk** is the risk a firm's common stockholders would face if the firm had no debt. Business risk arises from uncertainty in projections of the firm's cash flows, which in turn means uncertainty about its operating profit and its capital (investment) requirements. In other words, we do not know for sure how large operating profits will be, nor do we know how much we will have to invest to develop new products, build new plants, and so forth. The return on invested capital (ROIC) combines these two sources of uncertainty, and its variability can be used to measure business risk on a stand-alone basis:

$$\text{ROIC} = \frac{\text{NOPAT}}{\text{Capital}} = \frac{\text{EBIT}(1 - \text{T})}{\text{Capital}}$$

$$= \frac{\text{Net income to common stockholders} + \text{After-tax interest payments}}{\text{Capital}}.$$

Here NOPAT is net operating profit after taxes, and capital is the required amount of operating capital, which is numerically equivalent to the sum of the firm's debt and common equity. Business risk can then be measured by the standard deviation of ROIC, σ_{ROIC}. If the firm's capital requirements are stable, then we can use the variability in EBIT, σ_{EBIT}, as an alternative measure of stand-alone business risk. Business risk depends on a number of factors, as described below:

1. *Demand variability.* The more stable the demand for a firm's products, other things held constant, the lower its business risk.
2. *Sales price variability.* Firms whose products are sold in highly volatile markets are exposed to more business risk than similar firms whose output prices are more stable.

[2]Preferred stock also adds to financial risk. To simplify matters, we concentrate on debt and common equity in this chapter.

3. *Input cost variability.* Firms whose input costs are highly uncertain are exposed to a high degree of business risk.
4. *Ability to adjust output prices for changes in input costs*. Some firms are better able than others to raise their own output prices when input costs rise. The greater the ability to adjust output prices to reflect cost conditions, the lower the business risk.
5. *Ability to develop new products in a timely, cost-effective manner*. Firms in such high-tech industries as drugs and computers depend on a constant stream of new products. The faster that products become obsolete, the greater the business risk.
6. *Foreign risk exposure*. Firms that generate a high percentage of their earnings overseas are subject to earnings declines due to exchange rate fluctuations. Also, if a firm operates in a politically unstable area, it may be subject to political risks. See Chapter 26 for a further discussion.
7. *The extent to which costs are fixed: operating leverage.* If a high percentage of its costs are fixed, hence do not decline when demand falls, then the firm is exposed to a relatively high degree of business risk. This factor is called *operating leverage,* and it is discussed at length in the next section.

Each of these factors is determined partly by the firm's industry characteristics, but each of them is also controllable to some extent by management. For example, most firms can, through their marketing policies, take actions to stabilize both unit sales and sales prices. However, this stabilization may require spending a great deal on advertising and/or price concessions to get commitments from customers to purchase fixed quantities at fixed prices in the future. Similarly, firms can reduce the volatility of future input costs by negotiating long-term labor and materials supply contracts, but they may have to pay prices above the current spot price to obtain these contracts. Many firms are also using hedging techniques to reduce business risk.

Operating Leverage

In physics, leverage implies the use of a lever to raise a heavy object with a small force. In politics, if people have leverage, their smallest word or action can accomplish a lot. *In business terminology, a high degree of* **operating leverage,** *other factors held constant, implies that a relatively small change in sales results in a large change in EBIT.*

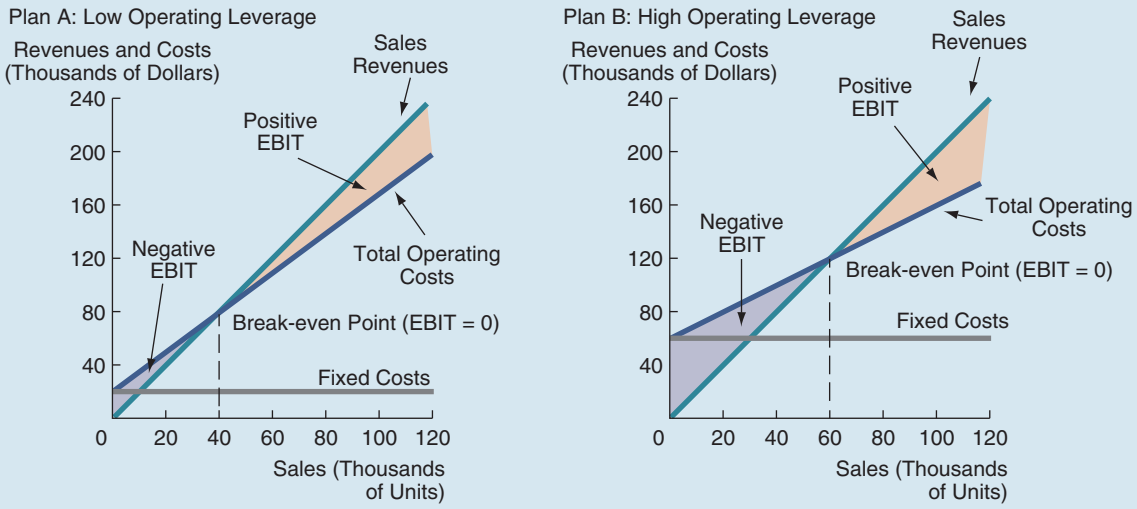
Other things held constant, the higher a firm's fixed costs, the greater its operating leverage. Higher fixed costs are generally associated with more highly automated, capital intensive firms and industries. However, businesses that employ highly skilled workers who must be retained and paid even during recessions also have relatively high fixed costs, as do firms with high product development costs, because the amortization of development costs is an element of fixed costs.

Consider Strasburg Electronics Company, a debt-free (unlevered) firm. Figure 16-1 illustrates the concept of operating leverage by comparing the results that Strasburg could expect if it used different degrees of operating leverage. Plan A calls for a relatively small amount of fixed costs, $20,000. Here the firm would not have much automated equipment, so its depreciation, maintenance, property taxes, and so on would be low. However, the total operating costs line has a relatively steep slope, indicating that variable costs per unit are higher than they would be if the firm used more operating leverage. Plan B calls for a higher level

e-resource

See ***FM12 Ch 16 Tool Kit.xls*** at the textbook's Web site for all calculations.

Figure 16-1 Illustration of Operating Leverage



	Plan A	Plan B
Price	$2.00	$2.00
Variable costs	$1.50	$1.00
Fixed costs	$20,000	$60,000
Capital	$200,000	$200,000
Tax rate	40%	40%

				Plan A				Plan B			
Demand	Probability	Units Sold	Dollar Sales Revenues	Total Operating Costs	Pre-Tax Operating Profit (EBIT)	Net Operating Profit after Taxes (NOPAT)	ROIC	Total Operating Costs	Pre-Tax Operating Profit (EBIT)	Net Operating Profit after Taxes (NOPAT)	ROIC
Terrible	0.05	0	$ 0	$ 20,000	($20,000)	($12,000)	−6.0%	$ 60,000	($ 60,000)	($ 36,000)	−18.0%
Poor	0.20	40,000	80,000	80,000	0	0	0.0	100,000	(20,000)	(12,000)	−6.0
Normal	0.50	100,000	200,000	170,000	30,000	18,000	9.0	160,000	40,000	24,000	12.0
Good	0.20	160,000	320,000	260,000	60,000	36,000	18.0	220,000	100,000	60,000	30.0
Wonderful	0.05	200,000	400,000	320,000	80,000	48,000	24.0%	260,000	140,000	84,000	42.0
Expected value:		100,000	$200,000	$170,000	$30,000	$18,000	9.0%	$160,000	$ 40,000	$ 24,000	12.0%
Standard deviation:					$24,698		7.4%		$ 49,396		14.8%
Coefficient of variation:					0.82		0.82		1.23		1.23

Notes:

[a]Operating costs = Variable costs + Fixed costs.

[b]The federal-plus-state tax rate is 40%, so NOPAT = EBIT(1 − Tax rate) = EBIT(0.6).

[c]ROIC = NOPAT/Capital.

[d]The break-even sales level for Plan B is not shown in the table, but it is 60,000 units or $120,000.

[e]The expected value, standard deviations, and coefficients of variation were found using the procedures discussed in Chapter 6.

of fixed costs, $60,000. Here the firm uses automated equipment (with which one operator can turn out a few or many units at the same labor cost) to a much larger extent. The break-even point is higher under Plan B—breakeven occurs at 60,000 units under Plan B versus only 40,000 units under Plan A.

We can calculate the break-even quantity by recognizing that **operating breakeven** occurs when earnings before interest and taxes (EBIT) = 0:[3]

$$\text{EBIT} = PQ - VQ - F = 0. \tag{16-3}$$

Here P is average sales price per unit of output, Q is units of output, V is variable cost per unit, and F is fixed operating costs. If we solve for the break-even quantity, Q_{BE}, we get this expression:

$$Q_{BE} = \frac{F}{P - V}. \tag{16-4}$$

Thus for Plan A,

$$Q_{BE} = \frac{\$20{,}000}{\$2.00 - \$1.50} = 40{,}000 \text{ units},$$

and for Plan B,

$$Q_{BE} = \frac{\$60{,}000}{\$2.00 - \$1.00} = 60{,}000 \text{ units}.$$

How does operating leverage affect business risk? *Other things held constant, the higher a firm's operating leverage, the higher its business risk.* The data in Figure 16-1 confirm this. Plan A's lower operating leverage gives rise to a much lower range of possible EBITs, from −$20,000 if demand is terrible to $80,000 if demand is wonderful, with a standard deviation of $24,698. Plan B's EBIT range is much larger, from −$60,000 to $140,000, and it has a standard deviation of $49,396. Plan A's ROIC range is lower as well, from −6.0% to 24.0%, with a standard deviation of 7.4%, versus Plan B's ROIC range of from −18% to 42%, with a standard deviation of 14.8%, which is twice as high as A's.

Even though Plan B is riskier, note also that it has a higher expected EBIT and ROIC: $40,000 and 12% versus A's $30,000 and 9%. Therefore, Strasburg must make a choice between a project with a higher expected return but more risk and one with less risk but a lower return. For the rest of this analysis, we assume that Strasburg has decided to go with Plan B because management believes that the higher expected return is sufficient to compensate for the higher risk.

To a large extent, operating leverage is determined by technology. Electric utilities, telephone companies, airlines, steel mills, and chemical companies simply *must* have large investments in fixed assets; this results in high fixed costs and operating leverage. Similarly, drug, auto, computer, and other companies must spend heavily to develop new products, and product-development costs increase operating leverage. Grocery stores, on the other hand, generally have significantly

[3]This definition of breakeven does not include any fixed financial costs because Strasburg is an unlevered firm. If there were fixed financial costs, the firm would suffer an accounting loss at the operating break-even point. We introduce financial costs shortly.

lower fixed costs, hence lower operating leverage. Although industry factors do exert a major influence, all firms have some control over their operating leverage. For example, an electric utility can expand its generating capacity by building either a gas-fired or a coal-fired plant. The coal plant would require a larger investment and would have higher fixed costs, but its variable operating costs would be relatively low. The gas-fired plant, on the other hand, would require a smaller investment and would have lower fixed costs, but the variable costs (for gas) would be high. Thus, by its capital budgeting decisions, a utility (or any other company) can influence its operating leverage, hence its business risk.[4]

Financial Risk

Financial risk is the additional risk placed on the common stockholders as a result of the decision to finance with debt. Conceptually, stockholders face a certain amount of risk that is inherent in a firm's operations—this is its business risk, which is defined as the uncertainty inherent in projections of future ROIC. If a firm uses debt (financial leverage), this concentrates its business risk on its common stockholders. To illustrate, suppose ten people decide to form a corporation to manufacture disk drives. There is a certain amount of business risk in the operation. If the firm is capitalized only with common equity, and if each person buys 10% of the stock, then each investor shares equally in the business risk. However, suppose the firm is capitalized with 50% debt and 50% equity, with five of the investors putting up their capital as debt and the other five putting up their money as equity. In this case, the five investors who put up the equity will have to bear *virtually all* of the business risk, so the common stock will be much riskier than it would have been had the firm been financed only with equity. Thus, the use of debt, or **financial leverage,** concentrates the firm's business risk on its stockholders. This concentration of business risk occurs because debtholders, who receive fixed interest payments, bear none of the business risk.[5]

e-resource

See ***FM12 Ch 16 Tool Kit.xls*** at the textbook's Web site for detailed calculations.

To illustrate the concentration of business risk, we can extend the Strasburg Electronics example. To date, the company has never used debt, but the treasurer is now considering a possible change in the capital structure. For now, assume that only two financing choices are being considered—remaining at zero debt, or shifting to $100,000 debt and $100,000 book equity.

First, focus on Section I of Table 16-1, which assumes that Strasburg uses no debt. Since debt is zero, interest is also zero; hence pre-tax income is equal to EBIT. Taxes at 40% are deducted to obtain net income, which is then divided by the $200,000 of book equity to calculate ROE. Note that Strasburg receives a tax credit if the demand is either terrible or poor (which are the two scenarios where net income is negative). Here we assume that Strasburg's losses can be carried back to offset income earned in the prior year. The ROE at each sales level is then multiplied by the probability of that sales level to calculate the 12% expected ROE. Note that this 12% is equal to the ROIC we found in Figure 16-1 for Plan B, since ROE is equal to ROIC if a firm has no debt.

Now let's look at the situation if Strasburg decides to use $100,000 of debt financing, shown in Section II of Table 16-1, with the debt costing 10%. Demand will not be affected, nor will operating costs; hence the EBIT columns are the same for the zero debt and $100,000 debt cases. However, the company will now have

[4]See ***Web Extension 16A*** for additional discussion of measuring the degree of operating leverage.
[5]Holders of corporate debt generally do bear some business risk, because they may lose some of their investment if the firm goes bankrupt. We discuss this in more depth later in the chapter.

Table 16-1

Effects of Financial Leverage: Strasburg Electronics Financed with Zero Debt or with $100,000 of Debt

Section I. Zero Debt

Debt	0
Book equity	$200,000

Demand for Product (1)	Probability (2)	EBIT (3)	Interest (4)	Pre-Tax Income (5)	Taxes (40%) (6)	Net Income (7)	ROE (8)
Terrible	0.05	($ 60,000)	$0	($ 60,000)	($24,000)	($36,000)	−18.0%
Poor	0.20	(20,000)	0	(20,000)	(8,000)	(12,000)	−6.0
Normal	0.50	40,000	0	40,000	16,000	24,000	12.0
Good	0.20	100,000	0	100,000	40,000	60,000	30.0
Wonderful	0.05	140,000	0	140,000	56,000	84,000	42.0
Expected value:		$ 40,000	$0	$ 40,000	$16,000	$24,000	12.0%
Standard deviation:							14.8%
Coefficient of variation:							1.23

Section II. $100,000 of Debt

Debt	$100,000
Book equity	$100,000
Interest rate	10%

Demand for Product (1)	Probability (2)	EBIT (3)	Interest (4)	Pre-Tax Income (5)	Taxes (40%) (6)	Net Income (7)	ROE (8)
Terrible	0.05	($ 60,000)	$10,000	($ 70,000)	($28,000)	($42,000)	−42.0%
Poor	0.20	(20,000)	10,000	(30,000)	(12,000)	(18,000)	−18.0
Normal	0.50	40,000	10,000	30,000	12,000	18,000	18.0
Good	0.20	100,000	10,000	90,000	36,000	54,000	54.0
Wonderful	0.05	140,000	10,000	130,000	52,000	78,000	78.0
Expected value:		$ 40,000	$10,000	$ 30,000	$12,000	$18,000	18.0%
Standard deviation:							29.6%
Coefficient of variation:							1.65

Assumptions:

1. In terms of its operating leverage, Strasburg has chosen Plan B. The probability distribution and EBITs are obtained from Figure 16-1.
2. Sales and operating costs, hence EBIT, are not affected by the financing decision. Therefore, EBIT under both financing plans is identical, and it is taken from the EBIT column for Plan B in Figure 16-1.
3. All losses can be carried back to offset income in the prior year.

$100,000 of debt with a cost of 10%; hence its interest expense will be $10,000. This interest must be paid regardless of the state of the economy—if it is not paid, the company will be forced into bankruptcy, and stockholders will probably be wiped out. Therefore, we show a $10,000 cost in Column 4 as a fixed number for all demand conditions. Column 5 shows pre-tax income, Column 6 the applicable taxes, and Column 7 the resulting net income. When the net income figures are divided by the book equity—which will now be only $100,000 because $100,000 of the $200,000 total requirement was obtained as debt—we find the ROEs under each demand state. If demand is terrible and sales are zero, then a very large loss will be incurred, and the ROE will be −42.0%. However, if demand is wonderful, then ROE will be 78.0%. The probability-weighted average is the expected ROE, which is 18.0% if the company uses $100,000 of debt.

Typically, financing with debt increases the common stockholders' expected rate of return for an investment, but debt also increases the common stockholders' risk. This situation holds with our example—financial leverage raises the expected ROE from 12% to 18%, but it also increases the risk of the investment as seen by the increase in the standard deviation from 14.8% to 29.6% and the increase in the coefficient of variation from 1.23 to 1.65.[6]

We see, then, that using leverage has both good and bad effects: Higher leverage increases expected ROE, but it also increases risk. The next section discusses how this trade-off between risk and return affects the value of the firm.[7]

SELF-TEST

What is business risk, and how can it be measured?

What are some determinants of business risk?

How does operating leverage affect business risk?

What is financial risk, and how does it arise?

Explain this statement: "Using leverage has both good and bad effects."

A firm has fixed operating costs of $100,000 and variable costs of $4 per unit. If it sells the product for $6 per unit, what is the break-even quantity? (50,000)

16.3 Capital Structure Theory

In the previous section, we showed how capital structure choices affect a firm's ROE and its risk. For a number of reasons, we would expect capital structures to vary considerably across industries. For example, pharmaceutical companies generally have very different capital structures than airline companies. Moreover, capital structures vary among firms within a given industry. What factors explain these differences? In an attempt to answer this question, academics and practitioners have developed a number of theories, and the theories have been subjected to many empirical tests. The following sections examine several of these theories.[8]

[6]See Chapter 6 for a review of procedures for calculating the standard deviation and coefficient of variation. Recall that the advantage of the coefficient of variation is that it permits better comparisons when the expected values of ROE vary, as they do here for the two capital structures.

[7]For more on the links between market risk, operating risk, and financial leverage, see Carolyn M. Callahan and Rosanne M. Mohr, "The Determinants of Systematic Risk: A Synthesis," *The Financial Review*, May 1989, pp. 157–181; and Alexandros P. Prezas, "Effects of Debt on the Degrees of Operating and Financial Leverage," *Financial Management*, Summer 1987, pp. 39–44.

[8]For additional discussion of capital structure theories, see John C. Easterwood and Palani-Rajan Kadapakkam, "The Role of Private and Public Debt in Corporate Capital Structures," *Financial Management*, Autumn 1991, pp. 49–57; Gerald T. Garvey, "Leveraging the Underinvestment Problem: How High Debt and Management Shareholdings Solve the Agency Costs of Free Cash Flow," *Journal of Financial Research*, Summer 1992, pp. 149–166; Milton Harris and Artur Raviv, "Capital Structure and the Informational Role of Debt," *Journal of Finance*, June 1990, pp. 321–349; and Ronen Israel, "Capital Structure and the Market for Corporate Control: The Defensive Role of Debt Financing," *Journal of Finance*, September 1991, pp. 1391–1409.

Modigliani and Miller: No Taxes

Modern capital structure theory began in 1958, when Professors Franco Modigliani and Merton Miller (hereafter MM) published what has been called the most influential finance article ever written.[9] MM's study was based on some strong assumptions, including the following:

1. There are no brokerage costs.
2. There are no taxes.
3. There are no bankruptcy costs.
4. Investors can borrow at the same rate as corporations.
5. All investors have the same information as management about the firm's future investment opportunities.
6. EBIT is not affected by the use of debt.

If these assumptions hold true, MM proved that a firm's value is unaffected by its capital structure; hence the following situation must exist:

$$V_L = V_U = S_L + D. \quad \textbf{(16-5)}$$

Here V_L is the value of a levered firm, which is equal to V_U, the value of an identical but unlevered firm. S_L is the value of the levered firm's stock, and D is the value of its debt.

Recall that the WACC is a combination of the cost of debt and the relatively higher cost of equity, r_s. As leverage increases, more weight is given to low-cost debt, but equity gets riskier, driving up r_s. Under MM's assumptions, r_s increases by exactly enough to keep the WACC constant. Put another way, if MM's assumptions are correct, it does not matter how a firm finances its operations, so capital structure decisions would be irrelevant.

Despite the fact that some of these assumptions are obviously unrealistic, MM's irrelevance result is extremely important. By indicating the conditions under which capital structure is irrelevant, MM also provided us with clues about what is required for capital structure to be relevant and hence to affect a firm's value. MM's work marked the beginning of modern capital structure research, and subsequent research has focused on relaxing the MM assumptions in order to develop a more realistic theory of capital structure.

Another extremely important aspect of MM's work was their thought process. To make a long story short, they imagined two portfolios. The first contained all the equity of the unlevered firm, and it generated cash flows in the form of dividends. The second portfolio contained all the levered firm's stock and debt, so its cash flows were the levered firm's dividends and interest payments. Under MM's assumptions, the cash flows of the two portfolios would be identical. They then concluded that if two portfolios produce the same cash flows, they must have the same value.[10] As we showed in Chapter 9, this simple idea changed the entire

[9]Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review*, June 1958, pp. 261–297. Modigliani and Miller both won Nobel Prizes for their work.

[10]They actually showed that if the values of the two portfolios differed, then an investor could engage in riskless arbitrage: The investor could create a trading strategy (buying one portfolio and selling the other) that had no risk, required none of the investor's own cash, and resulted in a positive cash flow for the investor. This would be such a desirable strategy that everyone would try to implement it. But if everyone tries to buy the same portfolio, its price will be driven up by market demand, and if everyone tries to sell a portfolio, its price will be driven down. The net result of the trading activity would be to change the portfolio's values until they were equal and no more arbitrage was possible.

Yogi Berra on the MM Proposition

When a waitress asked Yogi Berra (Baseball Hall of Fame catcher for the New York Yankees) whether he wanted his pizza cut into four pieces or eight, Yogi replied: "Better make it four. I don't think I can eat eight."[a]

Yogi's quip helps convey the basic insight of Modigliani and Miller. The firm's choice of leverage "slices" the distribution of future cash flows in a way that is like slicing a pizza. MM recognized that if you fix a company's investment activities, it's like fixing the size of the pizza; no information costs means that everyone sees the same pizza; no taxes means the IRS gets none of the pie; and no "contracting costs" means nothing sticks to the knife.

So, just as the substance of Yogi's meal is unaffected by whether the pizza is sliced into four pieces or eight, the economic substance of the firm is unaffected by whether the liability side of the balance sheet is sliced to include more or less debt, at least under the MM assumptions.

[a]Lee Green, *Sportswit* (New York: Fawcett Crest, 1984), p. 228.

Source: "Yogi Berra on the MM Proposition," *Journal of Applied Corporate Finance*, Winter 1995, p. 6. Reprinted by permission of Stern Stewart Management.

financial world because it led to the development of options and derivatives. Thus, their paper's approach was just as important as its conclusions.

Modigliani and Miller: The Effect of Corporate Taxes

MM published a follow-up paper in 1963 in which they relaxed the assumption that there are no corporate taxes.[11] The Tax Code allows corporations to deduct interest payments as an expense, but dividend payments to stockholders are not deductible. This differential treatment encourages corporations to use debt in their capital structures. This means that interest payments reduce the taxes paid by a corporation, and if a corporation pays less to the government, more of its cash flow is available for its investors. In other words, the tax deductibility of the interest payments shields the firm's pre-tax income.

As in their earlier paper, MM introduced a second important way of looking at the effect of capital structure: The value of a levered firm is the value of an otherwise identical unlevered firm plus the value of any "side effects." While others expanded on this idea, the only side effect MM considered was the tax shield:

$$V_L = V_U + \text{Value of side effects} = V_U + \text{PV of tax shield}. \quad \textbf{(16-6)}$$

Under their assumptions, they showed that the present value of the tax shield is equal to the corporate tax rate, T, multiplied by the amount of debt, D:

$$V_L = V_U + TD. \quad \textbf{(16-7)}$$

With a tax rate of about 40%, this implies that every dollar of debt adds about 40 cents of value to the firm, and this leads to the conclusion that the optimal capital

[11]Franco Modigliani and Merton H. Miller, "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review*, June 1963, pp. 433–443.

structure is virtually 100% debt. MM also showed that the cost of equity, r_s, increases as leverage increases, but that it doesn't increase quite as fast as it would if there were no taxes. As a result, under MM with corporate taxes the WACC falls as debt is added.

Miller: The Effect of Corporate and Personal Taxes

Merton Miller (this time without Modigliani) later brought in the effects of personal taxes.[12] He noted that all of the income from bonds is generally interest, which is taxed as personal income at rates (T_d) going up to 38.6%, while income from stocks generally comes partly from dividends and partly from capital gains. Further, long-term capital gains are taxed at a rate of 20%, and this tax is deferred until the stock is sold and the gain realized. If stock is held until the owner dies, no capital gains tax whatsoever must be paid. So, on average, returns on stocks are taxed at lower effective rates (T_s) than returns on debt.

Because of the tax situation, Miller argued that investors are willing to accept relatively low before-tax returns on stock relative to the before-tax returns on bonds. (The situation here is similar to that with tax-exempt municipal bonds as discussed in Chapter 5 and preferred stocks held by corporate investors as discussed in Chapter 8.) For example, an investor might require a return of 10% on Strasburg's bonds, and if stock income were taxed at the same rate as bond income, the required rate of return on Strasburg's stock might be 16% because of the stock's greater risk. However, in view of the favorable treatment of income on the stock, investors might be willing to accept a before-tax return of only 14% on the stock.

Thus, as Miller pointed out, (1) the *deductibility of interest* favors the use of debt financing, but (2) the *more favorable tax treatment of income from stock* lowers the required rate of return on stock and thus favors the use of equity financing.

Miller showed that the net impact of corporate and personal taxes is given by this equation:

$$V_L = V_U = \left[1 - \frac{(1 - T_c)(1 - T_s)}{(1 - T_d)}\right]D. \qquad \textbf{(16-8)}$$

Here T_c is the corporate tax rate, T_s is the personal tax rate on income from stocks, and T_d is the tax rate on income from debt. Miller argued that the marginal tax rates on stock and debt balance out in such a way that the bracketed term in Equation 16-8 is zero, so $V_L = V_U$, but most observers believe that there is still a tax advantage to debt. For example, with a 40% marginal corporate tax rate, a 30% marginal rate on debt, and a 12% marginal rate on stock, the advantage of debt financing is

$$\begin{aligned} V_L &= V_U + \left[1 - \frac{(1 - 0.40)(1 - 0.12)}{(1 - 0.30)}\right]D \\ &= V_U + 0.25D. \end{aligned} \qquad \textbf{(16-8a)}$$

Thus it appears as though the presence of personal taxes reduces but does not completely eliminate the advantage of debt financing.

[12]Merton H. Miller, "Debt and Taxes," *Journal of Finance*, May 1977, pp. 261–275. Miller was president of the American Finance Association, and he delivered the paper as his presidential address.

Trade-Off Theory

MM's results also depend on the assumption that there are no **bankruptcy costs.** However, in practice bankruptcy can be quite costly. Firms in bankruptcy have very high legal and accounting expenses, and they also have a hard time retaining customers, suppliers, and employees. Moreover, bankruptcy often forces a firm to liquidate or sell assets for less than they would be worth if the firm were to continue operating. For example, if a steel manufacturer goes out of business, it might be hard to find buyers for the company's blast furnaces, even though they were quite expensive. Assets such as plant and equipment are often illiquid because they are configured to a company's individual needs and also because they are difficult to disassemble and move.

Note, too, that the *threat of bankruptcy*, not just bankruptcy per se, produces these problems. Key employees jump ship, suppliers refuse to grant credit, customers seek more stable suppliers, and lenders demand higher interest rates and impose more restrictive loan covenants if potential bankruptcy looms.

Bankruptcy-related problems are most likely to arise when a firm includes a great deal of debt in its capital structure. Therefore, bankruptcy costs discourage firms from pushing their use of debt to excessive levels.

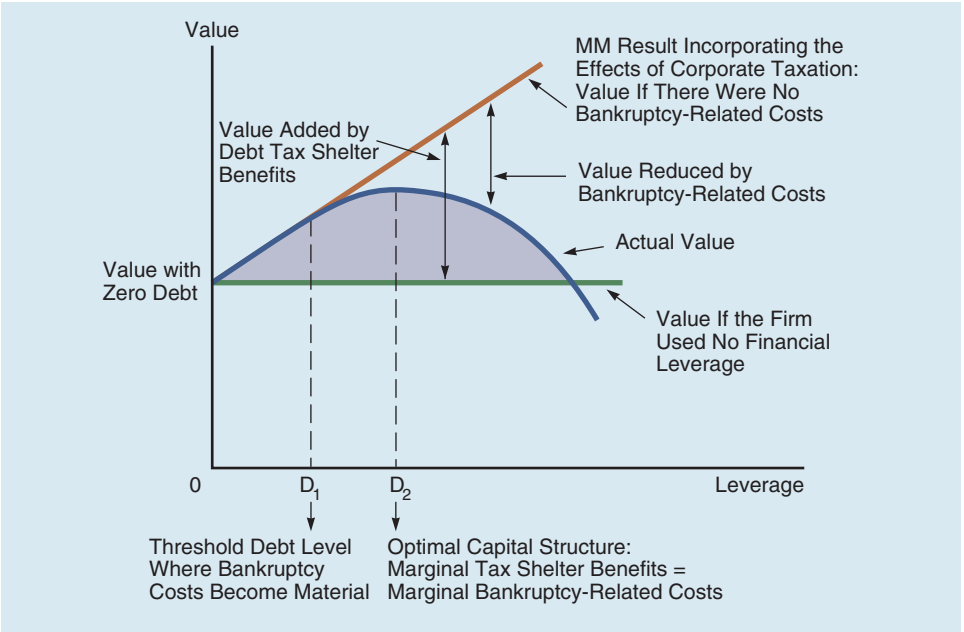
Bankruptcy-related costs have two components: (1) the probability of financial distress and (2) the costs that would be incurred given that financial distress occurs. Firms whose earnings are more volatile, all else equal, face a greater chance of bankruptcy and, therefore, should use less debt than more stable firms. This is consistent with our earlier point that firms with high operating leverage, and thus greater business risk, should limit their use of financial leverage. Likewise, firms that would face high costs in the event of financial distress should rely less heavily on debt. For example, firms whose assets are illiquid and thus would have to be sold at "fire sale" prices should limit their use of debt financing.

The preceding arguments led to the development of what is called "the trade-off theory of leverage," in which firms trade off the benefits of debt financing (favorable corporate tax treatment) against the higher interest rates and bankruptcy costs. In essence, the **trade-off theory** says that the value of a levered firm is equal to the value of an unlevered firm plus the value of any side effects, which include the tax shield and the expected costs due to financial distress. A summary of the trade-off theory is expressed graphically in Figure 16-2. Here are some observations about the figure:

1. Under the assumptions of the Modigliani-Miller with-corporate-taxes paper, a firm's value will be maximized if it uses virtually 100% debt, and the line labeled "MM Result Incorporating the Effects of Corporate Taxation" in Figure 16-2 expresses the relationship between value and debt under their assumptions.
2. There is some threshold level of debt, labeled D_1 in Figure 16-2, below which the probability of bankruptcy is so low as to be immaterial. Beyond D_1, however, expected bankruptcy-related costs become increasingly important, and they reduce the tax benefits of debt at an increasing rate. In the range from D_1 to D_2, expected bankruptcy-related costs reduce but do not completely offset the tax benefits of debt, so the stock price rises (but at a decreasing rate) as the debt ratio increases. However, beyond D_2, expected bankruptcy-related costs exceed the tax benefits, so from this point on increasing the debt ratio lowers the value of the stock. Therefore, D_2 is the optimal capital structure. Of course, D_1 and D_2 vary from firm to firm, depending on their business risks and bankruptcy costs.
3. While theoretical and empirical work support the general shape of the curve in Figure 16-2, this graph must be taken as an approximation, not as a precisely defined function.

Figure 16-2

Effect of Leverage on Value



Signaling Theory

MM assumed that investors have the same information about a firm's prospects as its managers—this is called **symmetric information.** However, in fact managers often have better information than outside investors. This is called **asymmetric information,** and it has an important effect on the optimal capital structure. To see why, consider two situations, one in which the company's managers know that its prospects are extremely positive (Firm P) and one in which the managers know that the future looks negative (Firm N).

Suppose, for example, that Firm P's R&D labs have just discovered a nonpatentable cure for the common cold. They want to keep the new product a secret as long as possible to delay competitors' entry into the market. New plants must be built to make the new product, so capital must be raised. How should Firm P's management raise the needed capital? If it sells stock, then, when profits from the new product start flowing in, the price of the stock would rise sharply, and the purchasers of the new stock would make a bonanza. The current stockholders (including the managers) would also do well, but not as well as they would have done if the company had not sold stock before the price increased, because then they would not have had to share the benefits of the new product with the new stockholders. *Therefore, one would expect a firm with very positive prospects to try to avoid selling stock and, rather, to raise any required new capital by other means, including using debt beyond the normal target capital structure.*[13]

Now let's consider Firm N. Suppose its managers have information that new orders are off sharply because a competitor has installed new technology

[13]It would be illegal for Firm P's managers to personally purchase more shares on the basis of their inside knowledge of the new product.

that has improved its products' quality. Firm N must upgrade its own facilities, at a high cost, just to maintain its current sales. As a result, its return on investment will fall (but not by as much as if it took no action, which would lead to a 100% loss through bankruptcy). How should Firm N raise the needed capital? Here the situation is just the reverse of that facing Firm P, which did not want to sell stock so as to avoid having to share the benefits of future developments. *A firm with negative prospects would want to sell stock, which would mean bringing in new investors to share the losses!*[14] The conclusion from all this is that firms with extremely bright prospects prefer not to finance through new stock offerings, whereas firms with poor prospects like to finance with outside equity. How should you, as an investor, react to this conclusion? You ought to say, "If I see that a company plans to issue new stock, this should worry me because I know that management would not want to issue stock if future prospects looked good. However, management *would* want to issue stock if things looked bad. Therefore, I should lower my estimate of the firm's value, other things held constant, if it plans to issue new stock."

If you gave the above answer, your views would be consistent with those of sophisticated portfolio managers. *In a nutshell, the announcement of a stock offering is generally taken as a* **signal** *that the firm's prospects as seen by its management are not bright. Conversely, a debt offering is taken as a positive signal.* Notice that Firm N's managers cannot make a false signal to investors by mimicking Firm P and issuing debt. With its unfavorable future prospects, issuing debt could soon force Firm N into bankruptcy. Given the resulting damage to the personal wealth and reputations of N's managers, they cannot afford to mimic Firm P. All of this suggests that when a firm announces a new stock offering, more often than not the price of its stock will decline. Empirical studies have shown that this situation does indeed exist.[15]

Reserve Borrowing Capacity

Because issuing stock emits a negative signal and thus tends to depress the stock price, even if the company's prospects are bright, it should, in normal times, maintain a **reserve borrowing capacity** that can be used in the event that some especially good investment opportunity comes along. *This means that firms should, in normal times, use more equity and less debt than is suggested by the tax benefit/bankruptcy cost trade-off model expressed in Figure 16-2.*

The Pecking Order Hypothesis

The presence of flotation costs and asymmetric information may cause a firm to raise capital according to a **pecking order.** In this situation a firm first raises capital internally by reinvesting its net income and selling off its short-term marketable securities. When that supply of funds has been exhausted, the firm will issue debt and perhaps preferred stock. Only as a last resort will the firm issue common stock.[16]

---

[14]Of course, Firm N would have to make certain disclosures when it offered new shares to the public, but it might be able to meet the legal requirements without fully disclosing management's worst fears.
[15]See Paul Asquith and David W. Mullins, Jr., "The Impact of Initiating Dividend Payments on Shareholders' Wealth," *Journal of Business*, January 1983, pp. 77–96.
[16]For more, see Jonathon Baskin, "An Empirical Investigation of the Pecking Order Hypothesis," *Financial Management*, Spring 1989, pp. 26–35.

Using Debt Financing to Constrain Managers

Agency problems may arise if managers and shareholders have different objectives. Such conflicts are particularly likely when the firm's managers have too much cash at their disposal. Managers often use excess cash to finance pet projects or for perquisites such as nicer offices, corporate jets, and sky boxes at sports arenas, all of which may do little to maximize stock prices. Even worse, managers might be tempted to pay too much for an acquisition, something that could cost shareholders hundreds of millions of dollars. By contrast, managers with limited "excess cash flow" are less able to make wasteful expenditures.

Firms can reduce excess cash flow in a variety of ways. One way is to funnel some of it back to shareholders through higher dividends or stock repurchases. Another alternative is to shift the capital structure toward more debt in the hope that higher debt service requirements will force managers to be more disciplined. If debt is not serviced as required, the firm will be forced into bankruptcy, in which case its managers would likely lose their jobs. Therefore, a manager is less likely to buy an expensive new corporate jet if the firm has large debt service requirements that could cost the manager his or her job. In short, high levels of debt **bond the cash flow,** since much of it is precommitted to servicing the debt.

A **leveraged buyout (LBO)** is one way to bond cash flow. In an LBO debt is used to finance the purchase of a company's shares, after which the firm "goes private." Many leveraged buyouts, which were especially common during the late 1980s, were designed specifically to reduce corporate waste. As noted, high debt payments force managers to conserve cash by eliminating unnecessary expenditures.

Of course, increasing debt and reducing the available cash flow has its downside: It increases the risk of bankruptcy. One professor has argued that adding debt to a firm's capital structure is like putting a dagger into the steering wheel of a car.[17] The dagger—which points toward your stomach—motivates you to drive more carefully, but you may get stabbed if someone runs into you, even if you are being careful. The analogy applies to corporations in the following sense: Higher debt forces managers to be more careful with shareholders' money, but even well-run firms could face bankruptcy (get stabbed) if some event beyond their control such as a war, an earthquake, a strike, or a recession occurs. To complete the analogy, the capital structure decision comes down to deciding how large a dagger stockholders should use to keep managers in line.

Finally, too much debt may overconstrain managers. A large portion of a manager's personal wealth and reputation is tied to a single company, so managers are not well diversified. When faced with a positive NPV project that is risky, a manager may decide that it's not worth taking on the risk, even when well-diversified stockholders would find the risk acceptable. As previously mentioned, this is an underinvestment problem. The more debt the firm has, the greater the likelihood of financial distress, and thus the greater the likelihood that managers will forgo risky projects even if they have positive NPVs.

The Investment Opportunity Set and Reserve Borrowing Capacity

Bankruptcy and financial distress are costly, and, as noted above, this can discourage highly levered firms from undertaking risky new investments. If potential new investments, although risky, have positive net present values, then high

[17]Ben Bernanke, "Is There Too Much Corporate Debt?" *Federal Reserve Bank of Philadelphia Business Review*, September/October 1989, pp. 3–13.

levels of debt can be doubly costly—the expected financial distress and bankruptcy costs are high, and the firm loses potential value by not making some potentially profitable investments. On the other hand, if a firm has very few profitable investment opportunities, then high levels of debt can keep managers from wasting money by investing in poor projects. For such companies, increases in the debt ratio can increase the value of the firm.

Thus, in addition to the tax, signaling, bankruptcy, and managerial constraint effects discussed earlier, the firm's optimal capital structure is related to its set of investment opportunities. Firms with many profitable opportunities should maintain their ability to invest by using low levels of debt, which is also consistent with maintaining reserve borrowing capacity. Firms with few profitable investment opportunities should use high levels of debt and thus have substantial interest payments, which means imposing managerial constraint through debt.[18]

Windows of Opportunity

If markets are efficient, then security prices should reflect all available information, so they are neither underpriced nor overpriced (except during the time it takes prices to move to a new equilibrium caused by the release of new information). The *windows of opportunity theory* states that managers don't believe this, but instead think that stock prices and interest rates are sometimes either too low or high relative to their true fundamental values. In particular, the theory suggests that managers issue equity when they believe stock market prices are abnormally high and issue debt when they believe interest rates are abnormally low. In other words, they try to time the market.[19] Notice that this differs from signaling theory because no asymmetric information is involved: These managers aren't basing their beliefs on insider information, just on a difference of opinion with the market consensus.

SELF-TEST

Why does the MM theory with corporate taxes lead to 100% debt?
Explain how *asymmetric information* and *signals* affect capital structure decisions.
What is meant by *reserve borrowing capacity*, and why is it important to firms?
How can the use of debt serve to discipline managers?

16.4 Capital Structure Evidence and Implications

There have been hundreds, perhaps even thousands, of papers testing the capital structure theories described in the previous section and we can only cover the highlights here.[20]

Empirical Evidence

Studies show that firms do benefit from the tax deductibility of interest payments, with a typical firm increasing in value by about $0.10 for every dollar of debt. This is much less than the corporate tax rate, so this supports the Miller model

[18]See Michael J. Barclay and Clifford W. Smith, Jr., "The Capital Structure Puzzle: Another Look at the Evidence," *Journal of Applied Corporate Finance*, Spring 1999, pp. 8–20.
[19]See Malcolm Baker and Jeffrey Wurgler, "Market Timing and Capital Structure," *Journal of Finance*, February 2002, pp. 1–32.
[20]This section also draws heavily from Barclay and Smith, "The Capital Structure Puzzle"; Jay Ritter, ed., *Recent Developments in Corporate Finance* (Northampton, MA: Edward Elgar Publishing Inc., 2005); and a presentation by Jay Ritter at the 2003 FMA meetings, "The Windows of Opportunity Theory of Capital Structure."

(with personal taxes) more than the MM model (with only corporate taxes). Recent evidence shows that the cost of bankruptcies can be as much as 10% to 20% of the firm's value.[21] Thus, the evidence shows the existence of tax benefits and financial distress costs, which provides support for the trade-off theory.

A particularly interesting study by Professors Mehotra, Mikkelson, and Partch examined the capital structure of firms that were spun off from their parents.[22] The financing choices of existing firms might be influenced by their past financing choices and by the costs of moving from one capital structure to another, but because spin-offs are newly created companies, managers can choose a capital structure without regard to these issues. The study finds that more profitable firms (which have a lower expected probability of bankruptcy) and more asset-intensive firms (which have better collateral and thus a lower cost of bankruptcy should one occur) have higher levels of debt. These findings support the trade-off theory.

However, there is also evidence that is inconsistent with a static optimal target capital structure as implied by the trade-off theory. For example, stock prices are very volatile, which causes a firm's actual market-based debt ratio to deviate frequently from its target. However, such deviations don't cause firms to immediately issue or repurchase securities in an effort to return to the target. This inertia indicates that if there is an optimal capital structure as implied by the trade-off theory, firms don't try to maintain it very closely.

In fact, if stock prices have a big run-up, which reduces the debt ratio, the trade-off theory suggests that firms should issue debt to return to their target. However, firms tend to do the opposite, and issue stock after big run-ups. This is much more consistent with the windows of opportunity theory, with managers trying to time the market by issuing stock when they perceive the market to be overvalued. Furthermore, firms tend to issue debt when stock prices and interest rates are low. The maturity of the issued debt seems to reflect an attempt to time interest rates: Firms tend to issue short-term debt if the term structure is upward sloping but long-term debt if the term structure is flat. Again, these facts suggest that managers try to time the market, which is consistent with the windows of opportunity theory.

Firms issue equity much less frequently than debt. On the surface, this seems to support both the pecking order hypothesis and the signaling hypothesis. The pecking order hypothesis predicts that firms with a high level of informational asymmetry, which causes equity issuances to be costly, should issue debt before issuing equity. However, we often see the opposite, with high-growth firms (which usually have greater informational asymmetry) issuing more equity than debt. Also, many highly profitable firms could afford to issue debt (which comes before equity in the pecking order) but instead choose to issue equity. With respect to the signaling hypothesis, consider the case of firms that have large increases in earnings that were unanticipated by the market. If managers have superior information, they will anticipate these upcoming performance improvements and issue debt before the increase. Such firms do, in fact, tend to issue debt slightly more frequently than other firms, but the difference isn't economically meaningful.

Many firms have less debt than might be expected, and many have large amounts of short-term investments. This is especially true for firms with high market/book ratios (which indicate many growth options and informational asymmetry problems). This behavior is consistent with the hypothesis that investment opportunities influence attempts to maintain reserve borrowing capacity. It is also consistent

[21]The *expected cost* of financial distress is the product of bankruptcy costs and the probability of bankruptcy. At moderate levels of debt with low probabilities of bankruptcy, the expected cost of financial distress would be much less than actual bankruptcy costs if the firm failed.

[22]See V. Mehotra, W. Mikkelson, and M. Partch, "The Design of Financial Policies in Corporate Spin-offs," *Review of Financial Studies*, Winter 2003, pp. 1359–1388.

Taking a Look at Global Capital Structures

To what extent does capital structure vary across different countries? The accompanying table, which is taken from a study by Raghuram Rajan and Luigi Zingales, both of the University of Chicago, shows the median debt ratios of firms in the largest industrial countries.

Rajan and Zingales also show that there is considerable variation in capital structure among firms within each of the seven countries. However, they also show that capital structures for the firms in each country are generally determined by a similar set of factors: firm size, profitability, market-to-book ratio, and the ratio of fixed assets to total assets. All in all, the Rajan–Zingales study suggests that the points developed in the chapter apply to firms all around the world.

Median Percentage of Debt to Total Assets in Different Countries

Country	Book Value Debt Ratio
Canada	32%
France	18
Germany	11
Italy	21
Japan	21
United Kingdom	10
United States	25

Source: Raghuram G. Rajan and Luigi Zingales, "What Do We Know about Capital Structure? Some Evidence from International Data," *The Journal of Finance*, December 1995, pp. 1421–1460.

with tax considerations, since low-growth firms, which have more debt, are more likely to be able to use the tax shield. This behavior is not consistent with the pecking order hypothesis, where low-growth firms, which often have high free cash flow, would be able to avoid issuing debt by raising funds internally.

Summarizing these results, it appears that firms try to capture debt's tax benefits while avoiding financial distress costs. However, they also allow their debt ratios to deviate from the static optimal target ratio implied by the trade-off theory. There is a little evidence indicating that firms follow a pecking order and use security issuances as signals, but there is much more evidence in support of the windows of opportunity theory. Finally, it appears that firms often maintain reserve borrowing capacity, especially those with many growth opportunities or problems with informational asymmetry.[23]

Implications for Managers

Managers should explicitly consider tax benefits when making capital structure decisions. Tax benefits obviously are more valuable for firms with high tax rates. Firms can utilize tax loss carryforwards and carrybacks, but the time value of

[23]For more on empirical tests of capital structure theory, see Gregor Andrade and Steven Kaplan, "How Costly Is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions That Became Distressed," *Journal of Finance*, 1998, pp. 1443–1493; Malcolm Baker, Robin Greenwood, and Jeffrey Wurgler, "The Maturity of Debt Issues and Predictable Variation in Bond Returns," *Journal of Financial Economics*, November 2003, pp. 261–291; Murray Z. Frank and Vidhan K. Goyal, "Testing the Pecking Order Theory of Capital Structure," *Journal of Financial Economics*, February 2003, pp. 217–248; Michael Long and Ileen Malitz, "The Investment-Financing Nexus: Some Empirical Evidence," *Midland Corporate Finance Journal*, Fall 1985, pp. 53–59.

money means that tax benefits are more valuable for firms with stable, positive pre-tax income. Therefore, a firm whose sales are relatively stable can safely take on more debt and incur higher fixed charges than a company with volatile sales. Other things being equal, a firm with less operating leverage is better able to employ financial leverage because it will have less business risk and less volatile earnings.

Managers should also consider the expected cost of financial distress, which depends on the probability and cost of distress. Notice that stable sales and lower operating leverage provide tax benefits but also reduce the *probability* of financial distress. One *cost* of financial distress comes from lost investment opportunities. Firms with profitable investment opportunities need to be able to fund them, either by holding higher levels of marketable securities or by maintaining excess borrowing capacity. An astute corporate treasurer made this statement to the authors:

"Our company can earn a lot more money from good capital budgeting and operating decisions than from good financing decisions. Indeed, we are not sure exactly how financing decisions affect our stock price, but we know for sure that having to turn down a promising venture because funds are not available will reduce our long-run profitability."

Another cost of financial distress is the possibility of being forced to sell assets to meet liquidity needs. General-purpose assets that can be used by many businesses are relatively liquid and make good collateral, in contrast to special-purpose assets. Thus, real estate companies are usually highly levered, whereas companies involved in technological research are not.

Asymmetric information also has a bearing on capital structure decisions. For example, suppose a firm has just successfully completed an R&D program, and it forecasts higher earnings in the immediate future. However, the new earnings are not yet anticipated by investors, hence are not reflected in the stock price. This company should not issue stock—it should finance with debt until the higher earnings materialize and are reflected in the stock price. Then it could issue common stock, retire the debt, and return to its target capital structure.

Managers should consider conditions in the stock and bond markets. For example, during a recent credit crunch, the junk bond market dried up, and there was simply no market at a "reasonable" interest rate for any new long-term bonds rated below BBB. Therefore, low-rated companies in need of capital were forced to go to the stock market or to the short-term debt market, regardless of their target capital structures. When conditions eased, however, these companies sold bonds to get their capital structures back on target.

Finally, managers should always consider lenders' and rating agencies' attitudes. For example, one large utility was recently told by Moody's and Standard & Poor's that its bonds would be downgraded if it issued more debt. This influenced its decision to finance its expansion with common equity. This doesn't mean that managers should never increase debt if it will cause their bond rating to fall, but managers should always factor this into their decision making.[24]

SELF-TEST

Which capital structure theories does the empirical evidence seem to support?
What issues should managers consider when making capital structure decisions?

[24]For some insights into how practicing financial managers view the capital structure decision, see John Graham and Campbell Harvey, "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics*, 2001, pp. 187–243; Ravindra R. Kamath, "Long-Term Financing Decisions: Views and Practices of Financial Managers of NYSE Firms," *Financial Review*, May 1997, pp. 331–356; Edgar Norton, "Factors Affecting Capital Structure Decisions," *Financial Review*, August 1991, pp. 431–446; J. Michael Pinegar and Lisa Wilbricht, "What Managers Think of Capital Structure Theory: A Survey," *Financial Management*, Winter 1989, pp. 82–91.

16.5 Estimating the Optimal Capital Structure

Managers should choose the capital structure that maximizes shareholders' wealth. The basic approach is to consider a trial capital structure, based on the market values of the debt and equity, and then estimate the wealth of the shareholders under this capital structure. This approach is repeated until an optimal capital structure is identified. There are five steps for the analysis of each potential capital structure: (1) Estimate the interest rate the firm will pay. (2) Estimate the cost of equity. (3) Estimate the weighted average cost of capital. (4) Estimate the free cash flows and their present value, which is the value of the firm. (5) Deduct the value of the debt to find the shareholders' wealth, which we want to maximize. The following sections explain each of these steps, using the company we considered earlier, Strasburg Electronics.

1. Estimating the Cost of Debt, r_d

The CFO asked Strasburg's investment bankers to estimate the cost of debt at different capital structures. The investment bankers began by analyzing industry conditions and prospects. They appraised Strasburg's business risk, based on its past financial statements and its current technology and customer base. The bankers also projected pro forma statements under various capital structures and analyzed such key ratios as the current ratio and the times-interest-earned ratio. Finally, they factored in current conditions in the financial markets, including interest rates paid by firms in Strasburg's industry. Based on their analysis and judgment, they estimated interest rates at various capital structures as shown in Table 16-2, starting with an 8% cost of debt if 10% or less of its capital is obtained as debt. Notice that the cost of debt goes up as leverage and the threat of bankruptcy increase.

2. Estimating the Cost of Equity, r_s

An increase in the debt ratio also increases the risk faced by shareholders, and this has an effect on the cost of equity, r_s. Recall from Chapter 6 that a stock's beta is

Table 16-2 The Cost of Debt for Strasburg Electronics with Different Capital Structures

Percent Financed with Debt (w_d)	Cost of Debt (r_d)
0%	8.0%
10	8.0
20	8.1
30	8.5
40	9.0
50	11.0
60	14.0

the relevant measure of risk for diversified investors. Moreover, it has been demonstrated, both theoretically and empirically, that beta increases with financial leverage. Indeed, Robert Hamada developed the **Hamada equation** to specify the effect of financial leverage on beta:[25]

$$b = b_U[1 + (1 - T)(D/S)]. \quad \textbf{(16-9)}$$

Here D is the market value of the debt and S is the market value of the equity. The Hamada equation shows how increases in the market value debt/equity ratio increase beta. Here $\mathbf{b_U}$ is the firm's **unlevered beta** coefficient, that is, the beta it would have if it had no debt. In that case, beta would depend entirely on business risk and thus be a measure of the firm's "basic business risk."

Note that beta is the only variable that can be influenced by management in the CAPM cost of equity equation, $r_s = r_{RF} + (RP_M)b$. The risk-free rate and market risk premium are determined by market forces that are beyond the firm's control. However, b is affected (1) by the firm's operating decisions as discussed earlier in the chapter, which affect b_U, and (2) by its capital structure decisions as reflected in its D/S ratio.

As a starting point, a firm can take its current beta, tax rate, and debt/equity ratio and calculate its unlevered beta, b_U, by simply transforming Equation 16-9 as follows:

$$b_U = b/[1 + (1 - T)(D/S)]. \quad \textbf{(16-10)}$$

Then, once b_U is determined, the Hamada equation can be used to estimate how changes in the debt/equity ratio would affect the levered beta, b, and thus the cost of equity, r_s.

We can apply the procedure to Strasburg Electronics. First, the risk-free rate of return, r_{RF}, is 6%, and the market risk premium, RP_M, is 6%. Next, we need the unlevered beta, b_U. Because Strasburg has no debt, D/S = 0. Therefore, its current beta of 1.0 is also its unlevered beta; hence $b_U = 1.0$. Therefore, Strasburg's current cost of equity is 12%:

$$\begin{aligned} r_s &= r_{RF} + RP_M(b) \\ &= 6\% + (6\%)(1.0) \\ &= 6\% + 6\% = 12\%. \end{aligned}$$

The first 6% is the risk-free rate, the second the risk premium. Because Strasburg currently uses no debt, it has no financial risk. Therefore, its 6% risk premium reflects only its business risk.

[25]See Robert S. Hamada, "Portfolio Analysis, Market Equilibrium, and Corporation Finance," *Journal of Finance*, March 1969, pp. 13–31. Note that Thomas Conine and Maurry Tamarkin extended Hamada's work to include risky debt. See "Divisional Cost of Capital Estimation: Adjusting for Leverage," *Financial Management*, Spring 1985, pp. 54–58. For a comprehensive framework, see Robert A. Taggart, Jr., "Consistent Valuation and Cost of Capital Expressions with Corporate and Personal Taxes," *Financial Management*, Autumn 1991, pp. 8–20.

Table 16-3

Strasburg's Optimal Capital Structure

Percent Financed with Debt, w_d (1)	Market Debt/Equity, D/S (2)[a]	After-Tax Cost of Debt, $(1-T)r_d$ (3)[b]	Estimated Beta, b (4)[c]	Cost of Equity, r_s (5)[d]	WACC (6)[e]	Value of Operations, V_{op} (7)[f]
0%	0.00%	4.80%	1.00	12.0%	12.00%	$200,000
10	11.11	4.80	1.07	12.4	11.64	206,186
20	25.00	4.86	1.15	12.9	11.29	212,540
30	42.86	5.10	1.26	13.5	11.01	217,984
40	**66.67**	**5.40**	**1.40**	**14.4**	**10.80**	**222,222**
50	100.00	6.60	1.60	15.6	11.10	216,216
60	150.00	8.40	1.90	17.4	12.00	200,000

Notes:

[a]The D/S ratio is calculated as $D/S = w_d/(1 - w_d)$.
[b]The interest rates are shown in Table 16-2, and the tax rate is 40%.
[c]The beta is estimated using Hamada's formula in Equation 16-9.
[d]The cost of equity is estimated using the CAPM formula: $r_s = r_{RF} + (RP_M)b$, where the risk-free rate is 6% and the market risk premium is 6%.
[e]The weighted average cost of capital is calculated using Equation 16-2: $WACC = w_{ce}r_s + w_d r_d(1 - T)$, where $w_{ce} = (1 - w_d)$.
[f]The value of the firm's operations is calculated using the free cash flow valuation formula in Equation 16-1, modified to reflect the fact that since Strasburg has zero growth, $V_{op} = FCF/WACC$. Strasburg has zero growth, so it requires no investment in capital and its FCF is equal to its NOPAT. Using the EBIT shown in Table 16-1:

$$FCF = NOPAT - \text{Investment in capital} = EBIT(1 - T) - 0$$
$$= \$40{,}000(1 - 0.4) = \$24{,}000.$$

If Strasburg changes its capital structure by adding debt, this would increase the risk stockholders bear. That, in turn, would result in an additional risk premium. Conceptually, this situation would exist:

$$r_s = r_{RF} + \text{Premium for business risk} + \text{Premium for financial risk.}$$

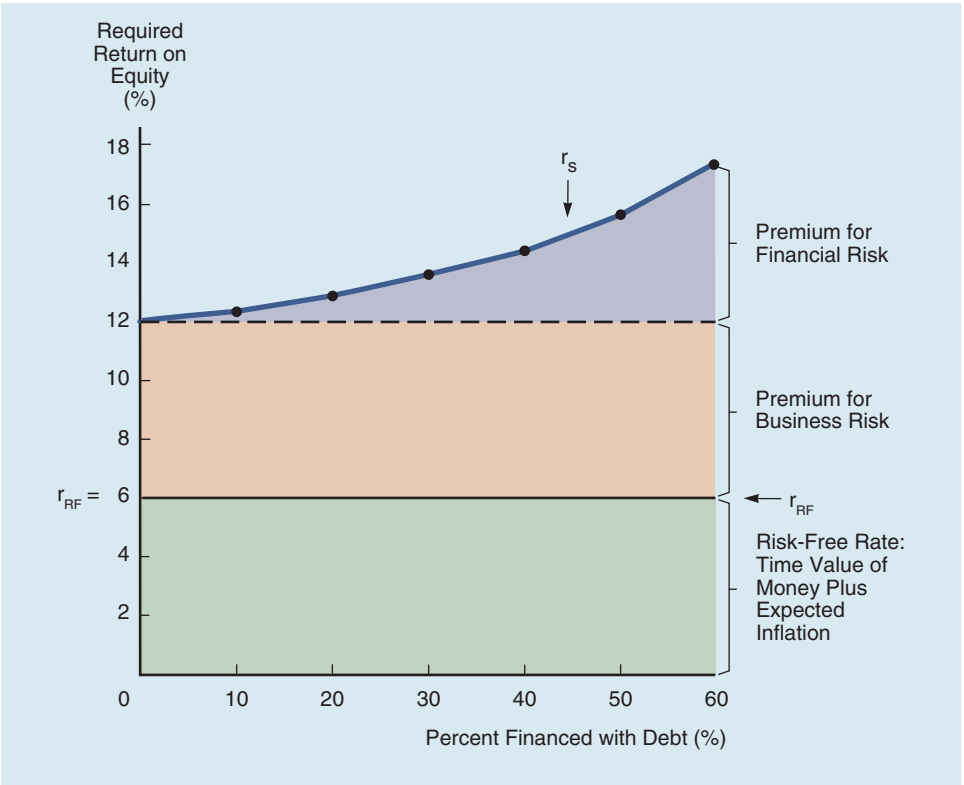
Column 4 of Table 16-3 shows Strasburg's estimated beta for the capital structures under consideration. Figure 16-3 (using data calculated in Column 5 of Table 16-3) graphs Strasburg's required return on equity at different debt ratios. As the figure shows, r_s consists of the 6% risk-free rate, a constant 6% premium for business risk, and a premium for financial risk that starts at zero but rises at an increasing rate as the debt ratio increases.

3. Estimating the Weighted Average Cost of Capital, WACC

Column 6 of Table 16-3 shows Strasburg's weighted average cost of capital, WACC, at different capital structures. Currently, it has no debt, so its capital structure is 100% equity, and at this point $WACC = r_s = 12\%$. As Strasburg begins to use debt (which has a lower cost than equity), the WACC declines. However, as the debt ratio increases, the costs of both debt and equity rise, at first slowly but

Figure 16-3

Strasburg's Required Rate of Return on Equity at Different Debt Levels



then at a faster and faster rate. Eventually, the increasing costs of the two components offset the fact that more debt (which is still less costly than equity) is being used. At 40% debt, Strasburg's WACC hits a minimum of 10.8%, and after that it rises with further increases in the debt ratio.

Note too that even though the component cost of equity is always higher than that of debt, using only lower-cost debt would not maximize value because of the feedback effects on the costs of debt and equity. If Strasburg were to issue more than 40% debt, the costs of both debt and equity would increase. Even though the cost of debt would be lower than the cost of equity, the overall WACC would increase because the costs of debt and equity increase.

4. Estimating the Firm's Value

We can estimate Strasburg's value of operations using Equation 16-1. Because Strasburg has zero growth, we can use the constant growth version of Equation 16-1:

$$V_{op} = \frac{FCF}{WACC}. \qquad \textbf{(16-1a)}$$

Recall that FCF is net operating profit after taxes (NOPAT) minus the required net investment in capital. Table 16-1 shows that Strasburg has an expected EBIT of

$40,000. With a tax rate of 40%, its expected NOPAT is $24,000 = $40,000 × (1 − 0.40). Since Strasburg has zero growth, its future net investments in operating assets will be zero, so its expected FCF is equal to NOPAT.

With zero debt, Strasburg has a WACC of 12% (shown in Column 6 of Table 16-3) and a value of

$$V_{op} = \frac{FCF}{WACC} = \frac{\$24,000}{0.12} = \$200,000.$$

Column 7 of Table 16-3 shows Strasburg's value of operations at different capital structures.[26] Notice that the maximum value of $222,222 occurs at a capital structure with 40% debt, which is also the capital structure that minimizes the WACC.

5. Estimating Shareholder Wealth and Stock Price

Strasburg should now **recapitalize,** meaning that it should issue the optimal amount of debt and then use the proceeds to repurchase stock. As shown in Table 16-3, financing with 40% debt is optimal. But before tackling the **recap,** as it is commonly called, let's consider the sequence of events, starting with the situation before Strasburg issues any debt.

Strasburg's Original Situation At its original capital structure, Strasburg's value of operations is $200,000, based on its FCF and WACC. Recall from Chapter 15 that to find a firm's total value, we add any short-term investments to the value of operations:

$$\text{Total corporate value} = V_{op} + \text{Value of short-term investments.}$$

Strasburg has no short-term investments, so its total value is

$$\text{Total corporate value} = \$200,000 + \$0 = \$200,000.$$

To find the initial estimated market value of equity, S_0, we subtract debt from the total value:[27]

$$S_0 = \text{Total corporate value} - \text{Value of all debt.}$$

Strasburg has no debt, so its equity value is

$$S_0 = \$200,000 - \$0 = \$200,000.$$

To find the stock price, we divide the equity value by the initial number of shares, n_0. Strasburg has 10,000 shares, so its price per share is $200,000/10,000 = $20. These calculations are summarized in Column 1 of Table 16-4. Column 1 also shows the wealth of the shareholders. The shareholders own Strasburg's equity, which is worth $200,000. Strasburg has not yet made any cash distributions to shareholders, so the total wealth of shareholders is $200,000.

[26] In this analysis we assume that Strasburg's expected EBIT and FCF are constant for the various capital structures. In a more refined analysis we might try to estimate any possible declines in FCF at high levels of debt as the threat of bankruptcy becomes imminent.

[27] We would also subtract preferred stock if the company has any.

Table 16-4 Anatomy of a Recapitalization

	Before Debt Issue (1)	After Debt Issue, But Before Repurchase (2)	After Repurchase (3)
V_{op}	$200,000	$222,222	$222,222
+ ST investments	0	88,889	0
V_{Total}	$200,000	$311,111	$222,222
− Debt	0	88,889	88,889
Value of equity (S)	$200,000	$222,222	$133,333
÷ No. shares	10,000	10,000	6,000
P	$20.00	$22.22	$22.22
Value of stock	$200,000	$222,222	$133,333
+ Cash distributed in repurchase	0	0	88,889
Wealth of shareholders	$200,000	$222,222	$222,222

Strasburg Issues New Debt The next step in the recap is to issue debt and announce the firm's intent to repurchase stock with the newly issued debt. We know the percent of debt in the new target capital structure and we know the resulting value of the firm, so we can find the dollar value of debt as follows:[28]

$$D = w_d V_{op}.$$

At the optimal capital structure of 40% debt, the value of the firm's operations is $222,222, as shown in Table 16-3. Therefore, the dollar value of debt in the optimal capital structure is about $88,889 = 0.40($222,222).[29] The amount of cash raised by issuing debt is

$$\text{Cash raised by issuing debt} = D - D_0,$$

where D_0 is the amount of debt the company has before any new debt is issued. Strasburg has no debt to start with, so Strasburg raises $88,889 with its debt issuance.

After issuing the debt but before repurchasing stock, Strasburg will temporarily put the cash proceeds from the debt issue into short-term investments until it is able to complete the repurchase, as shown in Column 2 of Table 16-4. Notice that the debt issuance has two major effects. First, the lower cost of capital causes the value of operations to increase to $222,222. Second, the firm temporarily has short-term investments equal to $88,889. Therefore, at the point in time after issuing debt but before repurchasing stock, Strasburg's total value is

$$\text{Total corporate value} = \$222,222 + \$88,889 = \$311,111.$$

[28]Strasburg does not plan on holding any short-term investments after the recap is completed. Therefore, after the recap the value of operations will also equal the total value of the firm.

[29]These calculations are shown in the *Excel* file ***FM12 Ch 16 Tool Kit.xls*** at the textbook's Web site. The values in the text are rounded, but the values used in calculations in the spreadsheet are not rounded.

The value of equity after the debt issue but prior to the repurchase, S_{Prior}, is

$$\begin{aligned} S_{Prior} &= \text{Value of equity after the debt issue but prior to the repurchase} \\ &= \text{Total corporate value} - \text{Value of all debt} \\ &= \$311{,}111 - \$88{,}889 = \$222{,}222. \end{aligned}$$

The price per share after issuing debt but prior to repurchasing stock, P_{Prior}, is

$$\begin{aligned} P_{Prior} &= \text{Price per share after debt issue but prior to repurchase} \\ &= \frac{\text{Value of equity after debt issue but prior to repurchase}}{\text{Number of shares outstanding prior to repurchase}} \\ &= S_{Prior}/n_0. \end{aligned}$$

Because Strasburg has not yet repurchased any stock, it still has 10,000 shares outstanding. Therefore, the price per share after the debt issue but prior to the repurchase is

$$\begin{aligned} P_{Prior} &= S_{Prior}/n_0 \\ &= \$222{,}222/10{,}000 = \$22.22. \end{aligned}$$

Column 2 of Table 16-4 summarizes these calculations. Column 2 also shows the wealth of the shareholders. The shareholders own Strasburg's equity, which is worth $222,222. Strasburg has not yet made any cash distributions to shareholders, so the total wealth of shareholders is $222,222. The new wealth of $222,222 is greater than the initial wealth of $200,000, so the recapitalization has added value to Strasburg's shareholders.

Comparing Column 2 of Table 16-4 with Column 1, we see that the issuance of debt and the resulting change to the optimal capital structure: (1) decreases the WACC, (2) increases the value of operations, (3) increases shareholder wealth, and (4) increases the stock price.

Strasburg Repurchases Stock What happens to the stock price during the repurchase? The short answer is "nothing." It is true that the additional debt will change the WACC and the stock price prior to the repurchase, but the subsequent repurchase itself will not affect the stock price.[30] To see why this is true, suppose the stock price is expected to increase after the repurchase. If this were true, it would be possible for an investor to buy the stock the day before the repurchase and then reap a reward the very next day. Current stockholders would realize this and would refuse to sell the stock unless they were paid the price that is expected immediately after the repurchase. Now suppose the stock price is expected to fall immediately after the repurchase. If this were true, current shareholders would try to sell the stock prior to the repurchase, but their actions would drive the price down to the price that is expected after the repurchase. As this "thought experiment" shows, the repurchase itself does not change the stock price.

[30]As we discuss in Chapter 18, a stock repurchase may be a signal of a company's future prospects, or it may be the way a company "announces" a change in capital structure, and either of those situations could have an impact on estimated free cash flows or WACC. However, neither situation applies to Strasburg.

Therefore, the post-repurchase price, P, is equal to P_{Prior}, the stock price after the debt issue but prior to the repurchase:

$$P = P_{Prior}.$$

For Strasburg, the price prior to the repurchase is $22.22, and the price after the repurchase is $22.22. This is also the price Strasburg pays to repurchase shares during the repurchase.

Strasburg uses the entire amount of cash raised by the debt issue to repurchase stock. As shown earlier, the total cash raised is equal to $D_0 - D$. The number of shares repurchased is equal to the cash raised by issuing debt divided by the repurchase price:

$$\begin{aligned}\text{Number of shares repurchased} &= \frac{\text{Cash raised by issuing debt}}{\text{Repurchase price}} \\ &= \frac{D - D_0}{P}.\end{aligned} \tag{16-11}$$

Strasburg repurchases ($88,889 − $0)/$22.22 = 4,000 shares of stock.

The number of remaining shares after the repurchase, n, is equal to the initial number of shares minus the number that is repurchased:

$$\begin{aligned}n &= \text{Number of outstanding shares remaining after the repurchase} \\ &= n_0 - \text{Number of shares repurchased} \\ &= n_0 - \frac{D - D_0}{P}.\end{aligned} \tag{16-12}$$

For Strasburg, the number of remaining shares after the repurchase is

$$\begin{aligned}n &= n_0 - (D - D_0)/P \\ &= 10{,}000 - (\$88{,}889 - \$0)/\$22.22 \\ &= 10{,}000 - 4{,}000 = 6{,}000.\end{aligned}$$

Column 3 of Table 16-4 summarizes these post-repurchase results. The repurchase doesn't change the value of operations, which remains at $222,222. However, the short-term investments are sold and the cash is used to repurchase stock. Strasburg is left with no short-term investments, so its total value is $222,222. The repurchase doesn't affect the amount of debt, so Strasburg's value of equity is equal to its total value minus the debt:

$$S = \$222{,}222 - \$88{,}889 = \$133{,}333.$$

After the repurchase, Strasburg has 6,000 shares of stock. The price per share is

$$P = S/n = \$133{,}333/6{,}000 = \$22.22.$$

Shareholders now own an equity position in the company worth only $133,333, but they have received a cash distribution in the amount of $88,889, so

their total wealth is equal to the value of their equity plus the amount of cash they received: $133,333 + $88,889 = $222,222.

Here are some points worth noting. As shown in Column 2 of Table 16-4, the change in capital structure clearly added wealth to the shareholders, increased the price per share, and increased the cash (in the form of short-term investments) temporarily held by the company. However, the repurchase itself did not affect shareholder wealth or the price per share. The repurchase did reduce the cash held by the company and the number of shares outstanding, but shareholder wealth stayed constant. After the repurchase, shareholders directly own the funds used in the repurchase; before the repurchase, shareholders indirectly own funds. In either case, shareholders own the funds. The repurchase simply takes them out of the company's account and puts them into the shareholders' personal accounts.

The approach described above is based on the corporate valuation model and it will always provide the correct value for S, S_{Prior}, and P. However, there is a quicker way. After the recap is completed, the percent of equity in the capital structure, based on market values, is equal to $1 - w_d$. Therefore, the value of equity after the repurchase is

$$\begin{aligned} S &= V_{op}(1 - w_d) \\ &= \$222{,}222(1 - 0.4) = \$\,133{,}333, \end{aligned} \tag{16-13}$$

which is the same answer we obtained earlier.

The wealth of the shareholders after the debt is issued but prior to the repurchase is equal to S_{Prior}. Wealth doesn't change during the repurchase, so S_{Prior} is equal to the value of equity after completion of the recapitalization plus the cash shareholders receive in the repurchase. Therefore, S_{Prior} is

$$\begin{aligned} S_{Prior} &= S + (D - D_0) \\ &= \$133{,}333 + (\$\,88{,}889 - \$0) = \$222{,}222, \end{aligned} \tag{16-14}$$

as we obtained earlier.

We can use these relationships to define P:[31]

$$\begin{aligned} P &= P_{Prior} \\ &= S_{Prior}/n_0 \\ &= [S + (D - D_0)]/n_0 \\ &= [\$133{,}333 + (\$88{,}889 - \$0)]/10{,}000 \\ &= \$22.22. \end{aligned} \tag{16-15}$$

[31]There are other ways to obtain Equation 16-15. By definition, P = S/n. Since P is also the stock price immediately prior to the repurchase and all debt proceeds are used to repurchase stock, the dollar value of repurchased shares is $P(n_0 - n) = D - D_0$. We have two equations, one defining the price per share after the repurchase and one defining the dollar value of repurchased stock. We have two unknowns, n and P. We can solve for the repurchase price: $P = (S + D - D_0)/n_0$.

Table 16-5 Strasburg's Stock Price and Earnings per Share

Percent Financed with Debt, w_d (1)	Value of Operations, V_{op} (2)[a]	Market Value of Debt, D (3)[b]	Market Value of Equity, S (4)[c]	Stock Price, P (5)[d]	Number of Shares after Repurchase, n (6)[e]	Net Income, NI (7)[f]	Earnings per Share, EPS (8)[g]
0%	$200,000	$ 0	$200,000	$20.00	$10,000	$24,000	$2.40
10	206,186	20,619	185,567	20.62	9,000	23,010	2.56
20	212,540	42,508	170,032	21.25	8,000	21,934	2.74
30	217,984	65,395	152,589	21.80	7,000	20,665	2.95
40	222,222	88,889	133,333	22.22	6,000	19,200	3.20
50	216,216	108,108	108,108	21.62	5,000	16,865	3.37
60	200,000	120,000	80,000	20.00	4,000	13,920	3.48

Notes:

[a]The value of operations is taken from Table 16-3.
[b]The value of debt is found by multiplying w_d from Column 1 by V_{op} from Column 2.
[c]The value of equity is found by multiplying $(1 - w_d)$ by V_{op}.
[d]The number of outstanding shares prior to the recap is $n_0 = 10{,}000$. The stock price is $P = [S + (D - D_0)]/n_0 = [S + D]/10{,}000$.
[e]The number of shares after repurchase is $n = S/P$.
[f]Net income is $NI = (EBIT - r_dD)(1 - T)$, where EBIT = $40,000 (taken from Table 16-1), r_d comes from Table 16-2, and T = 40%.
[g]$EPS = NI/n$.

Equations 16-13 and 16-15 provide exactly the same values for S and P as does the sequential corporate valuation approach of Table 16-4, but they do it more directly.

Analyzing the Results

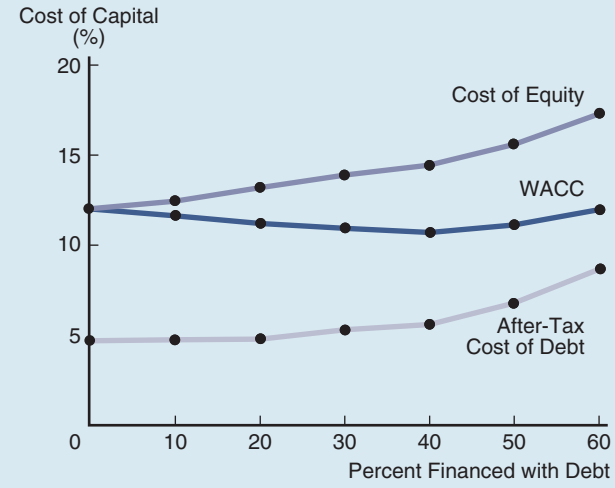
Table 16-5 repeats the analysis above and reports the value of operations, value of debt, value of equity, stock price, number of remaining shares, net income, and earnings per share for different capital structures. Notice that the price per share also is maximized under the same capital structure that minimizes the WACC and maximizes the value of the firm.

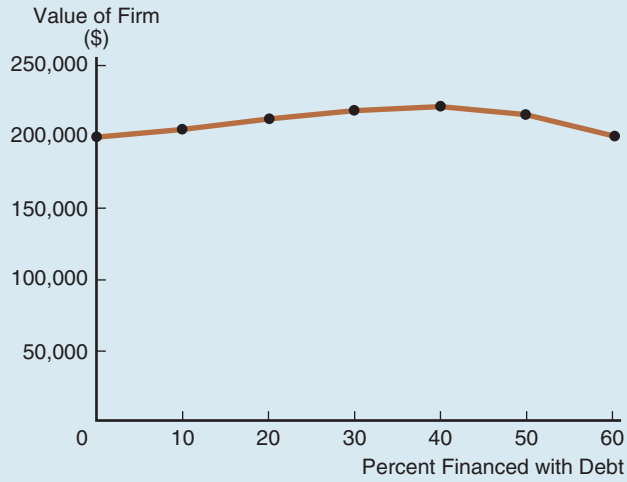
We summarize the results graphically in Figure 16-4. Notice that the cost of equity and the cost of debt both increase as debt increases. The WACC initially falls, but the rapidly increasing costs of equity and debt cause WACC to increase when the debt ratio goes above 40%. As indicated earlier, the minimum WACC and maximum corporate value occur at the same capital structure.

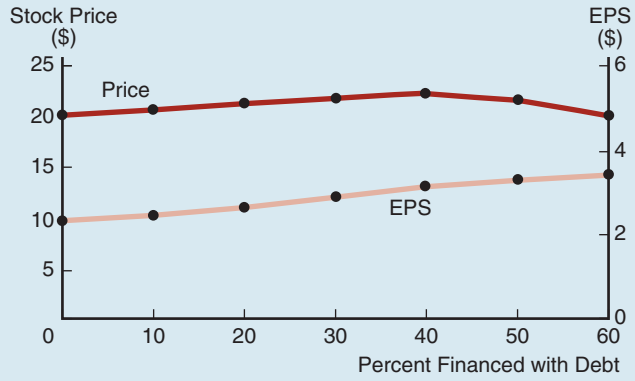
Now look closely at the curve for the value of the firm, and notice how flat it is around the optimal level of debt. Thus, it doesn't make a great deal of difference whether Strasburg's capital structure has 30% debt or 50%. Also, notice that the maximum value is about 11% greater than the value with no debt. Although this example is for a single company, the results are typical: The optimal capital structure can add 10% to 20% more value relative to zero debt, and there is a fairly wide region (from about 20% debt to 55%) over which value changes very little.

Figure 16-4

Effects of Capital Structure on Value, Cost of Capital, Stock Price, and EPS







In Chapter 15 we looked at value-based management and saw how companies can increase their value by improving their operations. There is good news and bad news regarding this. The good news is that small improvements in operations can lead to huge increases in value. But the bad news is that it's often very hard to improve operations, especially if the company is already well managed.

If instead you seek to increase a firm's value by changing its capital structure, we again have good news and bad news. The good news is that changing capital structure is very easy—just call an investment banker and issue debt (or the reverse if the firm has too much debt). The bad news is that this will add only a relatively small amount of value. Of course, any additional value is better than none, so it's hard to understand why there are some mature firms with zero debt.

Finally, Figure 16-4 shows that Strasburg's EPS steadily increases with leverage, while its stock price reaches a maximum and then begins to decline. For some companies there is a capital structure that maximizes EPS, but this is generally not the same capital structure that maximizes stock price. This is one additional reason we focus on cash flows and value rather than earnings.

SELF-TEST

What happens to the costs of debt and equity when the leverage increases? Explain.

Using the Hamada equation, show the effect of financial leverage on beta.

Using a graph and illustrative data, identify the premiums for financial risk and business risk at different debt levels. Do these premiums vary depending on the debt level? Explain.

Is expected EPS maximized at the optimal capital structure?

Use the Hamada equation to calculate the unlevered beta for JAB Industries, assuming the following data: $b_L = 1.4$; $T = 40\%$; $w_d = 0.45$. (0.939)

Suppose $r_{RF} = 6\%$ and $RP_M = 5\%$. What would the cost of equity be for JAB Industries if it has no debt? If w_d is 0.45? (10.70%; 13.0%)

A firm's value of operations is equal to $800 million after a recapitalization (the firm had no debt before the recap). The firm raised $200 million in new debt and used this to buy back stock. The firm had no short-term investments before or after the recap. After the recap, $w_d = 0.25$. The firm had 10 million shares before the recap. What is S (the value of equity after the recap)? What is P (the stock price) after the recap? What is n (the number of remaining shares) after the recap? (S = $600 million; P = $80; n = 7.5 million)

Summary

This chapter examined the effects of financial leverage on stock prices, earnings per share, and the cost of capital. The key concepts covered are listed below:

- A firm's **optimal capital structure** is that mix of debt and equity that maximizes the stock price. At any point in time, management has a specific **target capital structure** in mind, presumably the optimal one, although this target may change over time.
- Several factors influence a firm's capital structure. These include its (1) **business risk,** (2) **tax position,** (3) need for **financial flexibility,** (4) **managerial conservatism or aggressiveness,** and (5) **growth opportunities.**
- **Business risk** is the riskiness inherent in the firm's operations if it uses no debt. A firm will have little business risk if the demand for its products is stable, if the prices of its inputs and products remain relatively constant, if it can adjust its prices freely if costs increase, and if a high percentage of its costs are variable and hence will decrease if sales decrease. Other things the same, the lower a firm's business risk, the higher its optimal debt ratio.

- **Financial leverage** is the extent to which fixed-income securities (debt and preferred stock) are used in a firm's capital structure. **Financial risk** is the added risk borne by stockholders as a result of financial leverage.
- **Operating leverage** is the extent to which fixed costs are used in a firm's operations. In business terminology, a high degree of operating leverage, other factors held constant, implies that a relatively small change in sales results in a large change in ROIC.
- Robert Hamada used the underlying assumptions of the CAPM, along with the Modigliani and Miller model, to develop the **Hamada equation,** which shows the effect of financial leverage on beta as follows:

$$b = b_U[1 + (1 - T)(D/S)].$$

Firms can take their current beta, tax rate, and debt/equity ratio to arrive at their **unlevered beta, b_U,** as follows:

$$b_U = b/[1 + (1 - T)(D/S)].$$

- **Modigliani and Miller** and their followers developed a **trade-off theory of capital structure.** They showed that debt is useful because interest is **tax deductible,** but also that debt brings with it costs associated with actual or potential bankruptcy. The optimal capital structure strikes a balance between the tax benefits of debt and the costs associated with bankruptcy.
- An alternative (or, really, complementary) theory of capital structure relates to the **signals** given to investors by a firm's decision to use debt versus stock to raise new capital. A stock issue sets off a negative signal, while using debt is a positive, or at least a neutral, signal. As a result, companies try to avoid having to issue stock by maintaining a **reserve borrowing capacity,** and this means using less debt in "normal" times than the MM trade-off theory would suggest.
- A firm's owners may decide to use a relatively large amount of debt to constrain the managers. A **high debt ratio raises the threat of bankruptcy,** which not only carries a cost but also forces managers to be more careful and less wasteful with shareholders' money. Many of the corporate takeovers and leveraged buyouts in recent years were designed to improve efficiency by reducing the cash flow available to managers.

Although each firm has a theoretically optimal capital structure, as a practical matter we cannot estimate it with precision. Accordingly, financial executives generally treat the optimal capital structure as a range—for example, 40% to 50% debt—rather than as a precise point, such as 45%. The concepts discussed in this chapter help managers understand the factors they should consider when they set the target capital structure ranges for their firms.

Questions

(16-1) Define each of the following terms:
a. Capital structure; business risk; financial risk
b. Operating leverage; financial leverage, break-even point
c. Reserve borrowing capacity

(16-2) What term refers to the uncertainty inherent in projections of future ROIC?

(16-3) Firms with relatively high nonfinancial fixed costs are said to have a high degree of what?

(16-4) "One type of leverage affects both EBIT and EPS. The other type affects only EPS." Explain this statement.

(16-5) Why is the following statement true? "Other things being the same, firms with relatively stable sales are able to carry relatively high debt ratios."

(16-6) Why do public utility companies usually have capital structures that are different from those of retail firms?

(16-7) Why is EBIT generally considered to be independent of financial leverage? Why might EBIT actually be influenced by financial leverage at high debt levels?

(16-8) If a firm went from zero debt to successively higher levels of debt, why would you expect its stock price to first rise, then hit a peak, and then begin to decline?

Self-Test Problems

Solutions Appear in Appendix A

(ST-1) Optimal Capital Structure

The Rogers Company is currently in this situation: (1) EBIT = $4.7 million; (2) tax rate, T = 40%; (3) value of debt, D = $2 million; (4) r_d = 10%; (5) r_s = 15%; (6) shares of stock outstanding, n_0 = 600,000; and stock price, P_0 = $30. The firm's market is stable, and it expects no growth, so all earnings are paid out as dividends. The debt consists of perpetual bonds.

a. What is the total market value of the firm's stock, S, and the firm's total market value, V?
b. What is the firm's weighted average cost of capital?
c. Suppose the firm can increase its debt so that its capital structure has 50% debt, based on market values (it will issue debt and buy back stock). At this level of debt, its cost of equity rises to 18.5% and its interest rate on all debt will rise to 12% (it will have to call and refund the old debt). What is the WACC under this capital structure? What is the total value? How much debt will it issue, and what is the stock price after the repurchase? How many shares will remain outstanding after the repurchase?

(ST-2) Hamada Equation

Lighter Industrial Corporation (LIC) is considering a large-scale recapitalization. Currently, LIC is financed with 25% debt and 75% equity. LIC is considering increasing its level of debt until it is financed with 60% debt and 40% equity. The beta on its common stock at the current level of debt is 1.5, the risk-free rate is 6%, the market risk premium is 4%, and LIC faces a 40% federal-plus-state tax rate.

a. What is LIC's current cost of equity?
b. What is LIC's unlevered beta?
c. What will be the new beta and new cost of equity if LIC recapitalizes?

Problems Answers Appear in Appendix B

Easy Problems 1–6

(16-1) Break-even Quantity

Shapland Inc. has fixed operating costs of $500,000 and variable costs of $50 per unit. If it sells the product for $75 per unit, what is the break-even quantity?

(16-2) Unlevered Beta

Counts Accounting has a beta of 1.15. The tax rate is 40% and Counts is financed with 45% debt. What is Counts's unlevered beta?

(16-3) Premium for Financial Risk

Ethier Enterprise has an unlevered beta of 1.0. Ethier is financed with 50% debt and has a levered beta of 1.6. If the risk-free rate is 5.5% and the market risk premium is 6%, how much is the additional premium that Ethier's shareholders require to be compensated for financial risk?

(16-4) Value of Equity after Recapitalization

Nichols Corporation's value of operations is equal to $500 million after a recapitalization (the firm had no debt before the recap). It raised $200 million in new debt and used this to buy back stock. Nichols had no short-term investments before or after the recap. After the recap, $w_d = 0.4$. What is S (the value of equity after the recap)?

(16-5) Stock Price after Recapitalization

Lee Manufacturing's value of operations is equal to $900 million after a recapitalization (the firm had no debt before the recap). Lee raised $300 million in new debt and used this to buy back stock. Lee had no short-term investments before or after the recap. After the recap, $w_d = 1/3$. The firm had 30 million shares before the recap. What is P (the stock price after the recap)?

(16-6) Shares Remaining after Recapitalization

Dye Trucking raised $150 million in new debt and used this to buy back stock. After the recap, Dye's stock price is $7.5. If Dye had 60 million shares of stock before the recap, how many shares does it have after the recap?

Intermediate Problems 7–9

(16-7) Break-even Point

Schweser Satellites Inc. produces satellite earth stations that sell for $100,000 each. The firm's fixed costs, F, are $2 million; 50 earth stations are produced and sold each year; profits total $500,000; and the firm's assets (all equity financed) are $5 million. The firm estimates that it can change its production process, adding $4 million to investment and $500,000 to fixed operating costs. This change will (1) reduce variable costs per unit by $10,000 and (2) increase output by 20 units, but (3) the sales price on all units will have to be lowered to $95,000 to permit sales of the additional output. The firm has tax loss carryforwards that cause its tax rate to be zero, its cost of equity is 16%, and it uses no debt.

a. What is the incremental profit? To get a rough idea of the project's profitability, what is the project's expected rate of return for the next year (defined as the incremental profit divided by the investment)? Should the firm make the investment?
b. Would the firm's break-even point increase or decrease if it made the change?
c. Would the new situation expose the firm to more or less business risk than the old one?

(16-8) Business and Financial Risk

Here are the estimated ROE distributions for Firms A, B, and C:

	Probability				
	0.1	0.2	0.4	0.2	0.1
Firm A: ROE_A	0.0%	5.0%	10.0%	15.0%	20.0%
Firm B: ROE_B	(2.0)	5.0	12.0	19.0	26.0
Firm C: ROE_C	(5.0)	5.0	15.0	25.0	35.0

a. Calculate the expected value and standard deviation for Firm C's ROE. $ROE_A = 10.0\%$, $\sigma_A = 5.5\%$; $ROE_B = 12.0\%$, $\sigma_B = 7.7\%$.
b. Discuss the relative riskiness of the three firms' returns. (Assume that these distributions are expected to remain constant over time.)
c. Now suppose all three firms have the same standard deviation of basic earning power (EBIT/Total assets), $\sigma_A = \sigma_B = \sigma_C = 5.5\%$. What can we tell about the financial risk of each firm?

(16-9) Capital Structure Analysis

The Rivoli Company has no debt outstanding, and its financial position is given by the following data:

Assets (book = market)	$3,000,000
EBIT	$500,000
Cost of equity, r_s	10%
Stock price, P_0	$15
Shares outstanding, n_0	200,000
Tax rate, T (federal-plus-state)	40%

The firm is considering selling bonds and simultaneously repurchasing some of its stock. If it moves to a capital structure with 30% debt based on market values, its cost of equity, r_s, will increase to 11% to reflect the increased risk. Bonds can be sold at a cost, r_d, of 7%. Rivoli is a no-growth firm. Hence, all its earnings are paid out as dividends, and earnings are expectationally constant over time.

a. What effect would this use of leverage have on the value of the firm?
b. What would be the price of Rivoli's stock?
c. What happens to the firm's earnings per share after the recapitalization?
d. The $500,000 EBIT given previously is actually the expected value from the following probability distribution:

Probability	EBIT
0.10	($ 100,000)
0.20	200,000
0.40	500,000
0.20	800,000
0.10	1,100,000

Determine the times-interest-earned ratio for each probability. What is the probability of not covering the interest payment at the 30% debt level?

Challenging Problems 10–12

(16-10) Capital Structure Analysis

Pettit Printing Company has a total market value of $100 million, consisting of 1 million shares selling for $50 per share and $50 million of 10% perpetual bonds now selling at par. The company's EBIT is $13.24 million, and its tax rate is 15%. Pettit can change its capital structure by either increasing its debt to 70% (based on market values) or decreasing it to 30%. If it decides to *increase* its use of leverage, it must call its old bonds and issue new ones with a 12% coupon. If it decides to *decrease* its leverage, it will call in its old bonds and replace them with new 8% coupon bonds. The company will sell or repurchase stock at the new equilibrium price to complete the capital structure change.

The firm pays out all earnings as dividends; hence, its stock is a zero growth stock. Its current cost of equity, r_s, is 14%. If it increases leverage, r_s will be 16%. If it decreases leverage, r_s will be 13%. What is the firm's WACC and total corporate value under each capital structure?

(16-11) Optimal Capital Structure with Hamada

Beckman Engineering and Associates (BEA) is considering a change in its capital structure. BEA currently has $20 million in debt carrying a rate of 8%, and its stock price is $40 per share with 2 million shares outstanding. BEA is a zero growth firm and pays out all of its earnings as dividends. EBIT is $14.933 million, and BEA faces a 40% federal-plus-state tax rate. The market risk premium is 4%, and the risk-free rate is 6%. BEA is considering increasing its debt level to a capital structure with 40% debt, based on market values, and repurchasing shares with the extra money that it borrows. BEA will have to retire the old debt in order to issue new debt, and the rate on the new debt will be 9%. BEA has a beta of 1.0.

a. What is BEA's unlevered beta? Use market value D/S when unlevering.
b. What are BEA's new beta and cost of equity if it has 40% debt?
c. What are BEA's WACC and total value of the firm with 40% debt?

(16-12) WACC and Optimal Capital Structure

Elliott Athletics is trying to determine its optimal capital structure, which now consists of only debt and common equity. The firm does not currently use preferred stock in its capital structure, and it does not plan to do so in the future. To estimate how much its debt would cost at different debt levels, the company's treasury staff has consulted with investment bankers and, on the basis of those discussions, has created the following table:

Market Debt-to-Value Ratio (w_d)	Market Equity-to-Value Ratio (w_{ce})	Market Debt-to-Equity Ratio (D/S)	Bond Rating	Before-Tax Cost of Debt (r_d)
0.0	1.0	0.00	A	7.0%
0.2	0.8	0.25	BBB	8.0
0.4	0.6	0.67	BB	10.0
0.6	0.4	1.50	C	12.0
0.8	0.2	4.00	D	15.0

Elliott uses the CAPM to estimate its cost of common equity, r_s. The company estimates that the risk-free rate is 5%, the market risk premium is 6%, and its tax rate is 40%. Elliott estimates that if it had no debt, its "unlevered" beta, b_U, would be 1.2. Based on this information, what is the firm's optimal capital structure, and what would the weighted average cost of capital be at the optimal capital structure?

Spreadsheet Problem

(16-13) Build a Model: WACC and Optimal Capital Structure

FM e-resource

Start with the partial model in the file ***FM12 Ch 16 P13 Build a Model.xls*** from the textbook's Web site. Rework Problem 16-12 using a spreadsheet model. After completing the problem as it appears, answer the following related questions.

a. Plot a graph of the after-tax cost of debt, the cost of equity, and the WACC versus the debt/value ratio.

b. Would the optimal capital structure change if the unlevered beta changed? To answer this question, do a sensitivity analysis of WACC on b_U for different levels of b_U.

Cyberproblem

FM e-resource

Please go to the textbook's Web site to access any Cyberproblems.

Mini Case

Assume you have just been hired as business manager of PizzaPalace, a pizza restaurant located adjacent to campus. The company's EBIT was $500,000 last year, and since the university's enrollment is capped, EBIT is expected to remain constant (in real terms) over time. Since no expansion capital will be required, PizzaPalace plans to pay out all earnings as dividends. The management group owns about 50% of the stock, and the stock is traded in the over-the-counter market.

The firm is currently financed with all equity; it has 100,000 shares outstanding; and P_0 = $25 per share. When you took your corporate finance course, your instructor stated that most firms' owners would be financially better off if the firms used some debt. When you suggested this to your new boss, he encouraged you to pursue the idea. As a first step, assume that you obtained from the firm's investment banker the following estimated costs of debt for the firm at different capital structures:

Percent Financed with Debt, w_d	r_d
0%	—
20	8.0%
30	8.5
40	10.0
50	12.0

If the company were to recapitalize, debt would be issued, and the funds received would be used to repurchase stock. PizzaPalace is in the 40%

state-plus-federal corporate tax bracket, its beta is 1.0, the risk-free rate is 6%, and the market risk premium is 6%.

a. Provide a brief overview of capital structure effects. Be sure to identify the ways in which capital structure can affect the weighted average cost of capital and free cash flows.
b. (1) What is business risk? What factors influence a firm's business risk?
   (2) What is operating leverage, and how does it affect a firm's business risk? Show the operating break-even point if a company has fixed costs of $200, a sales price of $15, and variable costs of $10.
c. Now, to develop an example that can be presented to PizzaPalace's management to illustrate the effects of financial leverage, consider two hypothetical firms: Firm U, which uses no debt financing, and Firm L, which uses $10,000 of 12% debt. Both firms have $20,000 in assets, a 40% tax rate, and an expected EBIT of $3,000.
   (1) Construct partial income statements, which start with EBIT, for the two firms.
   (2) Now calculate ROE for both firms.
   (3) What does this example illustrate about the impact of financial leverage on ROE?
d. Explain the difference between financial risk and business risk.
e. Now consider the fact that EBIT is not known with certainty, but rather has the following probability distribution:

Economic State	Probability	EBIT
Bad	0.25	$2,000
Average	0.50	3,000
Good	0.25	4,000

   Redo the part a analysis for Firms U and L, but add basic earnings power (BEP), return on invested capital (ROIC, defined as NOPAT/Capital = EBIT(1 − T)/TA for this company), and the times-interest-earned (TIE) ratio to the outcome measures. Find the values for each firm in each state of the economy, and then calculate the expected values. Finally, calculate the standard deviations. What does this example illustrate about the impact of debt financing on risk and return?
f. What does capital structure theory attempt to do? What lessons can be learned from capital structure theory? Be sure to address the MM models.
g. What does the empirical evidence say about capital structure theory? What are the implications for managers?
h. With the above points in mind, now consider the optimal capital structure for PizzaPalace.
   (1) For each capital structure under consideration, calculate the levered beta, the cost of equity, and the WACC.
   (2) Now calculate the corporate value.
i. Describe the recapitalization process and apply it to PizzaPalace. Calculate the resulting value of the debt that will be issued, the resulting market value of equity, the price per share, the number of shares repurchased, and the remaining shares. Considering only the capital structures under analysis, what is PizzaPalace's optimal capital structure?

Selected Additional Cases

The following cases from Textchoice, *Thomson Learning's online library, cover many of the concepts discussed in this chapter and are available at* ***http://www.textchoice2.com***.

Klein-Brigham Series:
Case 9, "Kleen Kar, Inc.," Case 43, "Mountain Springs, Inc." and Case 57, "Greta Cosmetics, Inc.," which present a situation similar to the Strasburg example in the text. Case 74, "The Western Company," and Case 99, "Moore Plumbing Supply," explore capital structure policies.

Brigham-Buzzard Series:
Case 8, "Powerline Network Corporation (Operating Leverage, Financial Leverage, and the Optimal Capital Structure)."