CHAPTER 15

Capital Structure Policy

Chapter **Outline**

15.1 A Glance at Capital Structure Choices in Practice **(pgs. 516–520)** → **Objective 1.** Describe a firm's capital structure.

15.2 Capital Structure Theory **(pgs. 520–531)** → **Objective 2.** Explain why firms have different capital structures and how capital structure influences a firm's weighted average cost of capital.

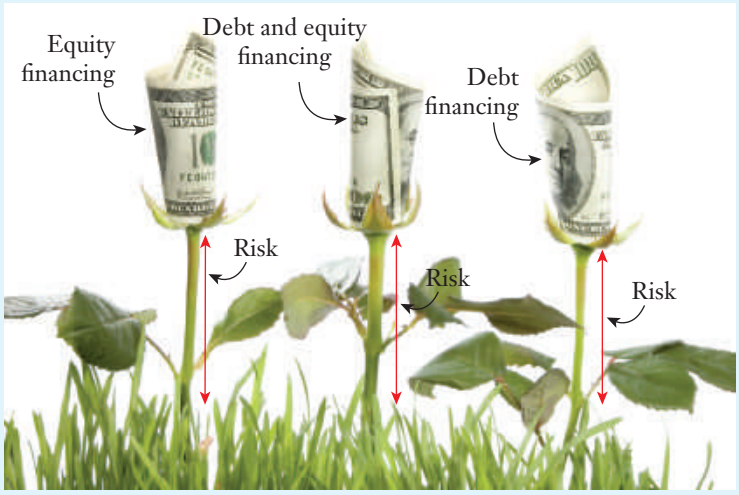
15.3 Why Do Capital Structures Differ Across Industries? **(pgs. 531–532)** → **Objective 3.** Describe some fundamental differences in industries that drive differences in the way they finance their investments.

15.4 Making Financing Decisions **(pgs. 532–545)** → **Objective 4.** Use the basic tools of financial analysis to analyze a firm's financing decisions.

Principles P2, P3, and P5 Applied

P Principle 2: **There Is a Risk-Return Tradeoff** provides us with insights as to why different firms have different capital structures. Managers are often motivated to take on more debt because it can increase the rate of return earned on the stockholders' investment in the firm. However, this higher expected return comes with a cost: The higher use of debt financing makes the firm's stock riskier, which increases the required rate of return on the stock. In addition, the additional debt makes it more likely that the firm will have financial difficulties in the future. P Principle 3: **Cash Flows Are the Source of Value** is also important for understanding capital structure. Indeed, one of the main messages from this chapter is that the capital structure choice is important only when it affects the total cash flows that can be distributed to the firm's equity and debt holders. P Principle 5: **Individuals Respond to Incentives** becomes important because if managers own only a small fraction of the firm's stock, they may act in their own self-interests rather than in the shareholders' interests. One way to help managers focus on shareholder interests is to increase the firm's debt obligations.

How Do Firms Finance Their Investments?



A firm's capital structure—the mix of the different sources of capital it uses to finance its investments—is a critical determinant of both the risk and the expected rate of return earned from investing in the firm's shares of common stock. As we discussed in Chapter 1, the firm's financing decision is one of the three fundamental decisions that are made by the financial manager.[1] However, different firms tend to make very different financing decisions. Some firms finance their investments primarily with debt, whereas others finance their investments primarily with equity. For example, in 2012 Apple (AAPL) had no bank debt or bonds outstanding, whereas American Electric Power (AEP) borrowed almost $18 billion in short- and long-term debt to help finance its $52 billion of total assets. The question of why different firms make different financing choices forms the basis of our study of capital structure in this chapter.

We open our discussion of capital structure by taking a closer look at the capital structures of a variety of different firms. After observing that different firms can have very different capital structures, we then turn to capital structure theory to help us understand why these differences exist. Finally, we conclude by discussing the tools used by financial managers to measure the costs and benefits that determine the optimal mix of debt and equity financing. To achieve this objective, the financial manager must consider several factors, including the tax consequences of debt versus equity financing, the costs of financial distress brought on by having too much debt, the effect of debt financing on managerial incentives, and the importance of information differences between company managers and outside investors.

[1]The three basic questions addressed in the study of finance concern (1) what long-term investments the firm should undertake, (ii) how the firm should raise the money needed to fund its investments (the subject of this chapter), and (iii) how the firm can best manage the cash flows that arise in its day-to-day operations.

Regardless of Your Major…

"Capital Structure Matters to You!"

When a firm borrows money, it is obligated by the terms of the loan agreement to repay it, and if it does not meet the terms of the agreement, it can be forced into bankruptcy. So when a firm uses more debt than it can afford to service, it faces the risk of defaulting on its financial obligations and being forced into bankruptcy. This has very costly implications for the firm's employees, creditors, and stockholders. This is exactly what happened in 2008 to the investment bank Lehman Brothers, which had a debt-to-equity ratio of 33 to 1, and in 2009 to the automaker General Motors, which owed more than $26 billion that it could not repay. If you were an employee of one of these companies, you may have lost your job, or at the very least, you were faced with a very uncertain future as the company attempted to work its way out of bankruptcy. If you were a stockholder, you probably lost all of your investment, and if you were a bondholder, you may have recovered pennies on the dollar. So, regardless of whether you work in sales, operations, or finance, you need to understand some basic facts about the different ways that firms raise capital and how these financing choices affect their earnings and their ability to invest in the future.

Your Turn: See Study Question 15–1.

15.1 A Glance at Capital Structure Choices in Practice

One of the primary duties of a financial manager is to raise capital to finance a firm's investments. For every dollar the firm invests, it must come up with a dollar of financing. In Chapter 14, we defined *capital structure* as the mix of debt and equity used by the firm. In this chapter, we will discuss how firms make the financing decision that determines their capital structure.

The primary objective of capital structure management is to maximize the total value of the firm's outstanding debt and equity. We refer to the mix of financing sources in the capital structure that maximizes this combined value as the **optimal capital structure**.

Defining a Firm's Capital Structure

A firm's capital structure consists of owners' equity and its interest-bearing debt, including short-term bank loans. You may recall from Chapter 14 that the firm's capital structure does not include everything listed on the liabilities and owners' equity side of the balance sheet. We define the combination of capital structure *plus* the firm's non-interest-bearing liabilities, such as accounts payable and accrued expenses, to be the firm's **financial structure**.

It is common practice to describe a firm's *financial structure* using the debt ratio, which is the proportion of a firm's assets that has been financed by liabilities:

$$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}} \qquad \textbf{(15–1)}$$

However, as we have pointed out, when analyzing a firm's capital structure, we restrict our attention to the firm's interest-bearing debt. In addition, as we learned in Chapter 14, it is customary to describe a firm's capital structure using current market values as opposed to book values. The ratio of debt to enterprise value satisfies both of these qualifications. The enterprise value of a firm is an alternative measure of firm value that looks at the market value of the firm, focusing on what it would cost to buy the entire company—that is, the market value of the firm's equity plus the cost of paying off its debts minus the proceeds from liquidating any excess or non-operating cash and near-cash (marketable securities) investments. Technically, we would like to use the market value of both debt and equity; however, the debt-to-enterprise-value ratio is typically computed using the book value of the firm's debt

obligations because it may not be possible to observe the market value of a firm's debt since debt obligations are not as actively traded as equity securities. Enterprise value is defined as follows:

$$\text{Enterprise Value} = \left(\begin{array}{c}\text{Book Value of}\\ \text{Interest-Bearing Debt}\end{array} - \begin{array}{c}\text{Excess}\\ \text{Cash}\end{array}\right) + \begin{array}{c}\text{Market Value of}\\ \text{Equity}\end{array} \quad \textbf{(15–2)}$$

Alternatively, where the term **net debt** is used to refer to the term in parenthesis, we define enterprise value as follows:

$$\text{Enterprise Value} = \begin{array}{c}\text{Net}\\ \text{Debt}\end{array} + \begin{array}{c}\text{Market Value of}\\ \text{Equity}\end{array} \quad \textbf{(15–2a)}$$

By subtracting excess cash from the firm's interest-bearing debt, the analyst is simply recognizing that the business could operate without these cash and near-cash investments and could use them to pay down the firm's debt. Therefore, the firm's use of debt financing is actually its net debt.

Note that the enterprise value is not the same as the market value of the firm's equity (often referred to as the firm's *market capitalization*). The **enterprise value** equals the sum of the firm's market capitalization (or market value of the firm's equity) and its net debt. We can measure a firm's use of debt financing using the debt-to-enterprise-value ratio, as follows:

$$\begin{array}{c}\text{Debt-to-Enterprise-}\\ \text{Value Ratio}\end{array} = \frac{\begin{array}{c}\text{Book Value of}\\ \text{Interest-Bearing Debt}\end{array} - \begin{array}{c}\text{Excess}\\ \text{Cash}\end{array}}{\left(\begin{array}{c}\text{Book Value of}\\ \text{Interest-Bearing Debt}\end{array} - \begin{array}{c}\text{Excess}\\ \text{Cash}\end{array}\right) + \begin{array}{c}\text{Market Value of}\\ \text{Equity}\end{array}} = \frac{\text{Net Debt}}{\text{Enterprise Value}} \quad \textbf{(15–3)}$$

The book value of a firm's interest-bearing debt includes short-term notes payable (e.g., bank loans), the current portion of the firm's long-term debt (a current liability because this portion of the firm's long-term debt must be repaid within one year or less), and the firm's long-term debt (loans that mature in more than one year plus bonds the firm has issued). Note that in both the numerator and the denominator of Equation (15–3), we net out the firm's excess or non-operating cash and near-cash assets. Keep in mind that we are not subtracting out the entire amount of the firm's cash and marketable security holdings because it would not be feasible to liquidate all cash holdings and still keep the firm running. As a consequence, we subtract only excess cash holdings.[2]

Table 15.1 contains the book-value-based debt ratio of total liabilities to total assets and the market-value-based debt-to-enterprise-value ratio of net debt to enterprise value for a sample of large U.S. corporations. Note that the debt ratio is always higher than the debt-to-enterprise-value ratio—and sometimes dramatically higher. There are two reasons for this: First, the book value of the firm's equity, which is part of the denominator in the first ratio, is almost always lower than its market-value counterpart, which is used in the denominator of the second ratio. Second, the net debt used in the numerator of the debt-to-enterprise-value ratio includes only interest-bearing debt and excludes non-interest-bearing debt such as accounts payable and accrued expenses. Thus, the numerator is larger and the denominator is smaller in the debt ratio than in the debt-to-enterprise-value ratio.

If we were to calculate the weighted average cost of capital for Wal-Mart (WMT), we would use the 16.8 percent debt-to-enterprise-value ratio as the weight for debt financing. Because Walmart does not have any preferred stock, the weight assigned to equity financing would be 1 minus 16.8 percent, or 83.2 percent.

In addition to the two debt ratios, Table 15.1 includes the times interest earned ratio. In Chapter 4, where we first introduced this ratio, we learned that it measures the firm's ability to pay the interest expense on its interest-bearing debt out of operating earnings. Specifically, the ratio is defined as follows:

$$\text{Times Interest Earned} = \frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}} \quad \textbf{(15–4)}$$

[2]Although this is technically true, when the enterprise value is reported in the financial press, it is standard practice to subtract the entire amount of the firm's cash and near-cash assets.

Table 15.1 Financial and Capital Structures for Selected Firms (Year-End 2015)

The debt ratio equals the ratio of the firm's total liabilities to its total assets. Total liabilities equal the sum of current and long-term liabilities, including both interest-bearing debt and non-interest-bearing liabilities such as accounts payable and accrued expenses. The debt-to-enterprise-value ratio equals the ratio of the firm's short- and long-term interest-bearing debt less excess cash and marketable securities to its enterprise value. The times interest earned ratio equals the ratio of the firm's net operating income or earnings before interest and taxes (EBIT) to its interest expense. The first two ratios measure the proportion of the firm's investments financed by borrowing, whereas the third ratio measures the ability of the firm to make the interest payments required to support its debt.

	Debt Ratio $\frac{\text{Total Liabilities}}{\text{Total Assets}}$	Debt-to-Enterprise-Value Ratio $\frac{\text{Net Debt}}{\text{Enterprise Value}}$	Times Interest Earned $\frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}}$
American Airlines (AAL)	95.4%	28.2%	4.79
American Electric Power (AEP)	71.8%	40.6%	3.65
Emerson Electric (EMR)	35.3%	11.6%	19.26
Ford (F)	87.9%	65.2%	4.32
General Electric (GE)	80.2%	19.1%	2.82
Wal-Mart (WMT)	60.0%	16.8%	11.03
Average	67.1%	30.7%	8.21
Maximum	87.9%	65.2%	19.26
Minimum	35.3%	11.6%	2.82

For the set of firms in Table 15.1, the average ratio of operating income to interest expense is 8.21, which indicates that the firms' operating earnings, on average, cover their interest expense by more than eight times. This would surely make lenders feel more confident they will be paid their interest in a timely manner than if this ratio were closer to 1 or less.[3]

We now have the following financial decision tools to evaluate the firm's capital structure.

Tools of Financial Analysis—Capital Structure Ratios

Name of Tool	Formula	What It Tells You
Debt ratio	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	• Measures the extent to which the firm has used borrowed money to finance its assets. • A higher ratio indicates a greater reliance on non-owner financing or financial leverage and more financial risk taken on by the firm.
Debt-to-enterprise-value ratio	$\frac{\text{Book Value of Interest-Bearing Debt} - \text{Excess Cash}}{\left(\text{Book Value of Interest-Bearing Debt} - \text{Excess Cash}\right) + \text{Market Value of Equity}} = \frac{\text{Net Debt}}{\text{Enterprise Value}}$	• A version of the debt ratio that uses current market values of equity as opposed to book values. • The higher the debt-to-enterprise-value ratio is, the more financial risk the firm is assuming.
Times interest earned	$\frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}}$	• Measures the firm's ability to pay its interest expense from operating income. • A higher ratio indicates a greater capability of the firm to pay its interest expense in a timely manner.

[3]Some firms actually have negative net debt. That is, they have larger excess cash and marketable securities balances than they have interest-bearing debt outstanding. This is fairly common for high-tech firms like Apple (AAPL) that maintain very large cash balances as a reserve source of funding for investments in new technologies that are difficult to finance in the public markets.

Financial Leverage

The term *financial leverage* is often used to describe a firm's capital structure. This terminology arises from the fact that borrowing a portion of the firm's capital at a fixed rate of interest provides the firm an opportunity to "leverage" the rate of return it earns on its total capital into an even higher rate of return on the firm's equity. We will look into this phenomenon much more closely later in the chapter; however, it should be noted that if the firm is earning 15 percent on its investments and paying only 9 percent on borrowed money, the 6 percent differential goes to the firm's owners. As a result, the firm's return on equity will be much higher than 15 percent. This is what is known as **favorable financial leverage**. If the firm earns only 9 percent on its investments and must pay 15 percent on borrowed money, then the 6 percent differential here must come out of the owners' share of the investment return, and they thus suffer and experience **unfavorable financial leverage**. The key determinant of whether the use of financial leverage is favorable is whether the firm is able to invest the borrowed money at a rate of return that exceeds its cost.

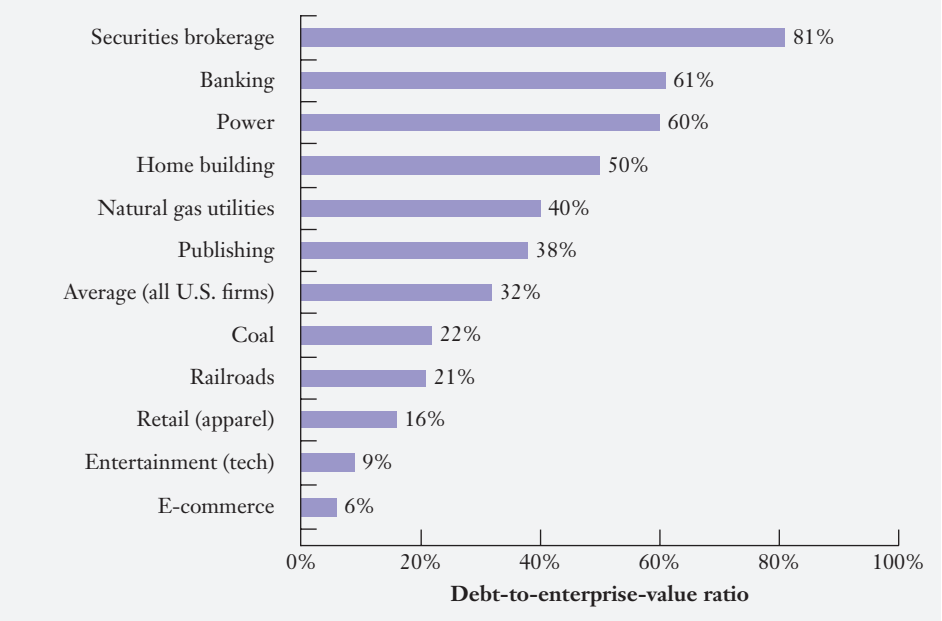
How Do Firms in Different Industries Finance Their Assets?

As we have already seen, firms vary quite a bit in their use of debt financing. We illustrate this in Figure 15.1, which shows variations in the debt-to-enterprise-value ratio across various industries. The average debt-to-enterprise-value ratio for the set of industries shown in the figure is 32 percent. However, the ratio is only 6 percent for e-commerce but 81 percent for securities brokerage. Why is it that firms choose to finance their investments in very different ways, with some using a large amount of debt or financial leverage and others choosing none? Should the firm's stockholders care about how much debt the firm uses? These are the fundamental issues that we now address in our discussion of capital structure theory.

Figure 15.1

Average Debt-to-Enterprise-Value Ratios for Firms in Selected Industries

The net debt of a firm includes only the book value of its interest-bearing short- and long-term debt less excess cash. We measure the enterprise value of a firm as the sum of the book value of its interest-bearing debt less excess cash and the market value of its equity. Note that because of the difficulty of calculating excess cash, we have assumed excess cash to be zero in these calculations.



>> END FIGURE 15.1

Before you move on to 15.2

Concept Check | 15.1

1. How does the debt ratio differ from the debt-to-enterprise-value ratio?
2. What does the times interest earned ratio measure?
3. What is financial leverage?
4. What determines whether financial leverage is favorable or unfavorable?

15.2 Capital Structure Theory

We open our discussion of capital structure choices in a hypothetical environment where financing choices do not affect firm value. In this setting, the financial manager should not be concerned about capital structure policy. Although the assumptions required for capital structure irrelevance are not realistic, they provide a good starting point for understanding the factors that financial managers should consider when determining their capital structure policy. We then relax these unrealistic assumptions and examine how they influence a firm's incentives to use debt and equity financing.

A First Look at the Modigliani and Miller Capital Structure Theorem

Franco Modigliani and Merton Miller's (M&M) analysis of the capital structure choice, which contributed to the Nobel Prize of each author, provides us with the conditions under which the capital structure decision has no influence on a firm's value and is therefore not a relevant concern for the firm's financial manager. This result is so important to the study of finance that it bears repeating: *M&M showed that, under some idealistic conditions, it does not matter whether a firm uses no debt, a little debt, or a lot of debt in its capital structure.*

Let's look at the basic assumptions that make capital structure irrelevant. It is a bit of a simplification, but M&M's capital structure theory relies on two fundamental assumptions:

- **Assumption 1:** *The cash flows that a firm generates are not affected by how the firm is financed.* As we will discuss later, this assumption requires that there are no taxes and no costs associated with bankruptcy and that the firm's debt obligations do not in any way affect its ability to operate its business.
- **Assumption 2:** *Financial markets are perfect.* This means that securities can be traded without cost and individuals can borrow and lend at the same rate as the firm.

Figure 15.2 illustrates Assumption 1. The pie charts represent the distribution of a firm's $500,000 cash flows based on two alternative capital structures. With Financing Mix A, the firm must repay its debt of $200,000. After repaying the debt obligation, the firm will have $300,000 left that it can distribute to its stockholders. With Financing Mix B, the firm has to repay a debt obligation of only $100,000. After repaying the $100,000 debt obligation, the firm will have $400,000 that it can distribute to its stockholders. Thus, the total amount of cash that the firm distributes to both its debt and equity holders is always equal to the firm's cash flows ($500,000 in our example), regardless of how the firm constructs its capital structure.

Assumption 2, the perfect financial markets assumption, implies that the packaging of cash flows (i.e., whether they are distributed to investors as dividends or interest payments) is not important. Under this assumption, the shareholders can repackage the cash flows provided by the firm in a way that replicates the cash flows they would receive under any possible capital structure.

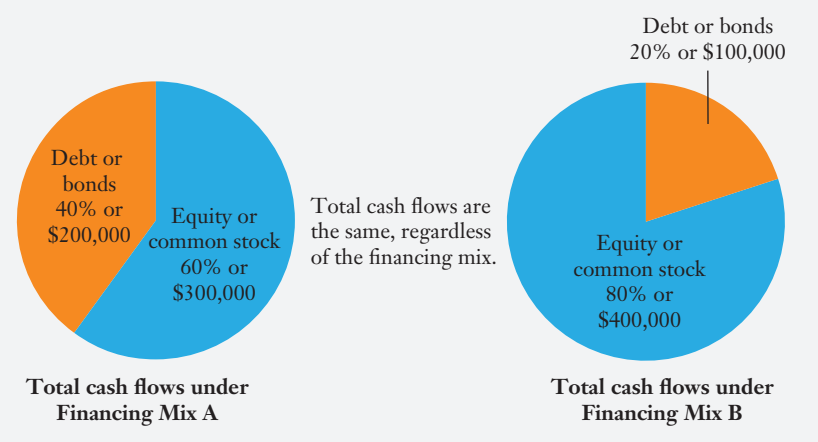
To understand this, consider two firms that are clones of one another except for how they have financed their investments. In other words, they generate the same total cash flows, but the ways those cash flows are divided between the firm's debt holders and equity holders differ. Specifically, Firm No-Debt has no debt, whereas Firm Half-Debt is financed with equal amounts of debt and equity.

Because Firm No-Debt and Firm Half-Debt are clones, their stock prices will be perfectly correlated. That is, when No-Debt's stock price increases, Firm Half-Debt's stock price

Figure 15.2

Assumption 1: Cash Distributions to Bondholders and Stockholders Are Not Affected by Financial Leverage

Assumption 1 of the M&M capital structure theory states that the total cash flows a firm has available to distribute to its common stockholders and bondholders are not affected by the firm's capital structure decision. Assumption 2 states that the value of the firm is determined by how much cash the firm has to distribute, not by what proportion of it goes to common stockholders or to bondholders. In this example, the firm's investments generate cash flows equal to $500,000, regardless of how the firm is financed.



>> END FIGURE 15.2

also increases. However, this does not mean that the levels of their risks are the same. Firm Half-Debt's stock will be a riskier investment: The firm's positive and negative returns will both be magnified because of the debt in its capital structure. For example, if Firm No-Debt's stock price increases by 10 percent, Firm Half-Debt's stock price might increase by 15 percent. This is the effect of financial leverage we described earlier. However, a portfolio that appropriately combines stock in Firm Half-Debt with a risk-free bond can have exactly the same risk as the stock in Firm No-Debt. In effect, investing in a risk-free bond (lending) cancels out the effect of Firm Half-Debt's borrowing. For example, if Firm Half-Debt is financed 50 percent with debt and 50 percent with equity, then a portfolio that includes an investment of $10,000 in debt and $10,000 in Firm Half-Debt stock will produce exactly the same returns as a portfolio that is 100 percent invested in Firm No-Debt stock. In other words, investors can undo the effect of the financial leverage in Firm Half-Debt's capital structure by including more bonds in their personal portfolios.

In reality, the relationship between Firm No-Debt stock and Firm Half-Debt stock just described may not be exact because of transaction costs and other market imperfections. This is why Assumption 2, which assumes that such costs do not exist, is required. If Assumption 2 holds, an investor who likes the returns generated by an investment of $20,000 in the stock of Firm No-Debt will be indifferent between directly purchasing the stock of Firm No-Debt and purchasing $10,000 of Firm Half-Debt's stock along with a $10,000 investment in a bond. Similarly, an investor who likes the returns generated by an investment of $10,000 in the stock of Firm Half-Debt can either directly purchase the stock of Firm Half-Debt or equivalently purchase $20,000 of Firm No-Debt's stock, financing $10,000 of the purchase by borrowing. The latter option, which combines debt and Firm No-Debt's shares, will produce exactly the same returns to the investor as purchasing Firm Half-Debt's shares.

This ability—in perfect markets—to transform the returns from investing in levered firms into the returns of investing in unlevered firms, and vice versa, means that no investor will ever pay more or less for a firm's shares simply because the firm either borrowed money or not. We will have more to say about how debt financing affects the risk and returns of a firm's stock, and in the appendix to this chapter, we will more explicitly demonstrate that this argument implies that capital structure does not affect how financial markets value a firm's cash flows. If a firm's capital structure choice does not affect the total cash flows it earns from its investments and if it does not affect how the total cash flows are valued by the financial

markets, then there will be no relation between a firm's capital structure and its total value. In effect, if these two assumptions hold, then *the total market value of the firm's debt and equity is independent of its capital structure decision, and the particular mix of debt and equity financing does not matter.*

Yogi Berra and the M&M Capital Structure Theory

When asked to summarize the M&M capital structure theory in a layperson's terms, legendary financial economist Merton Miller referred back to an old Yogi Berra line. When Yogi was asked if he wanted his pizza cut into four or eight pieces, Yogi paused and then decided on four pieces, saying "Cut it into four pieces because I don't think I can eat eight."[4] One doesn't have to be a Nobel Prize–winning economist to understand that the number of pieces that a pizza is cut into doesn't affect the total amount that is eaten. This is the point of Assumption 1: that the proportions of stocks and bonds issued by the firm do not affect the total amount of cash flows the firm can distribute. In effect, the size of the pizza pie (the value of the firm, which is determined by the cash flows to both creditors and owners) does not depend on the size of the slices (the portions of the firm's cash flows that are distributed to creditors or stockholders or the underlying portions of the firm's assets that have been financed with debt and equity). If the size of the pie is not affected by how it is cut, then one might also expect that the joy of eating the pie is also unaffected by how it is sliced. Under Assumption 2, positing that there are no transactions costs means that no pizza sticks to the knife, and positing that individuals can borrow or lend at the same rate as the firm means that there is no additional cost to cutting the pizza into more pieces. Thus, the choice of financing does not affect how those cash flows are valued by the financial markets.

Capital Structure, the Cost of Equity, and the Weighted Average Cost of Capital

Under the M&M capital structure theory, the value of the firm is not affected by how it is financed. As we briefly mentioned, an important part of Assumption 1 of this theorem is that the firm pays no taxes, which would have an important influence on the cash flows that can be distributed to the firm's investors.

When there are no taxes, the firm's weighted average cost of capital (WACC) is also unaffected by its capital structure. To illustrate why this must be the case, let's assume that we are valuing a firm whose cash flows are a level perpetuity. The value of the firm then is simply the ratio of the firm's free cash flow divided by its weighted average cost of capital

$$\text{Firm Value}(V) = \frac{\text{Firm Cash Flows}}{\text{Weighted Average Cost of Capital } (k_{WACC})} \tag{15–5}$$

where, as you will recall from Chapter 14, the firm's WACC for the case with no taxes is computed as follows:

$$k_{WACC} = \left[\begin{matrix}\text{Cost of}\\ \text{Debt } (k_d)\end{matrix} \times \begin{matrix}\text{Debt to}\\ \text{Value } (D/V)\end{matrix}\right] + \left[\begin{matrix}\text{Cost of}\\ \text{Equity } (k_e)\end{matrix} \times \begin{matrix}\text{Equity to}\\ \text{Value } (E/V)\end{matrix}\right] \tag{15–6}$$

Because firm value is unaffected by the firm's choice of capital structure and firm cash flows are likewise unaffected by capital structure, this implies that the firm's WACC is also unaffected. If we use the fact that, in this case, the firm's k_{WACC} will equal $k_{\text{Unlevered}}$, which is the cost of capital for an unlevered firm (one that uses no debt financing), it follows that, with the use of some algebra, the relationship between the cost of equity and the debt-to-equity ratio (D/E) is as follows:

$$\begin{matrix}\text{Cost of}\\ \text{Equity } (k_e)\end{matrix} = k_{\text{Unlevered}} + (k_{\text{Unlevered}} - k_d)\left(\frac{D}{E}\right) \tag{15–7}$$

[4]Yogi Berra played for the New York Yankees, was one of four players to be named the American League's Most Valuable Player three times, and was one of only six managers to lead both American and National League teams to the World Series. He also was famous for unusual quotes or "Yogi-isms," of which two of the most famous are "It ain't over until it's over" and "In theory there are no differences between theory and practice. In practice there is."

To illustrate the relationship among the capital structure, cost of equity, and WACC, consider the case of Elton Enterprises, Inc. Elton can borrow money at 8 percent, and its cost of capital if it uses no financial leverage (its unlevered cost of capital) is 10 percent. If Elton has a debt-to-equity ratio of 1.0 (which means that 50 percent of its capital structure is debt), the cost of debt is 8 percent, and the WACC is 10 percent, then the cost of equity, using Equation (15–7), is equal to 12 percent:

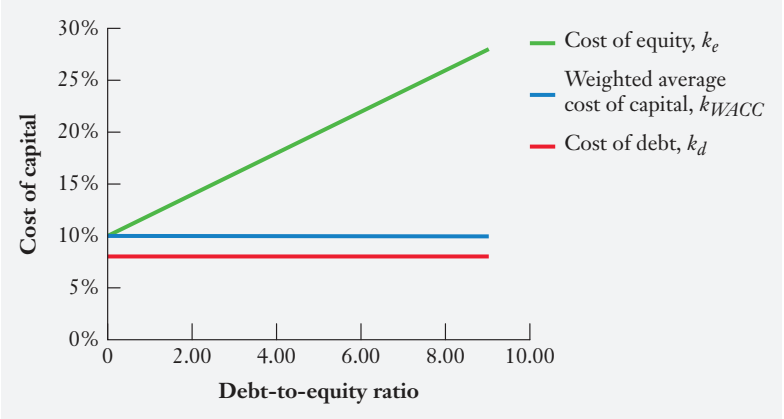
$$\text{Cost of Equity } (k_e) = k_{\text{Unlevered}} + (k_{\text{Unlevered}} - k_d)\left(\frac{D}{E}\right) = .10 + (.10 - .08) \times 1.0 = .12 \text{ or } 12\%$$

Note that the cost of equity found in Equation (15–7) increases with the debt-to-equity ratio, as we see in Figure 15.3. However, because there is less weight on the more expensive equity, the firm's WACC—as expressed in Equation (15–6)—does not change and is always equal to the cost of capital for an unlevered firm.

Figure 15.3

Cost of Capital and Capital Structure: M&M Theory

Under the M&M theory of capital structure (where there are no taxes), firm value and the firm's WACC are not affected by changes in the capital structure. Elton Enterprises has a weighted average cost of capital of 10 percent no matter how much debt the firm uses. Holding constant the cost of debt financing, this implies an increasing cost of equity, as found in Equation (15–7).



Debt-to-Equity Ratio	Weighted Average Cost of Capital	Cost of Debt	Cost of Equity
0.00	10%	8%	10.00%
0.11	10%	8%	10.22%
0.25	10%	8%	10.50%
0.43	10%	8%	10.86%
0.67	10%	8%	11.33%
1.00	10%	8%	12.00%
1.50	10%	8%	13.00%
2.33	10%	8%	14.67%
4.00	10%	8%	18.00%
9.00	10%	8%	28.00%

Legend:

$$k_{wacc} = \left[\text{Cost of Debt } (k_d) \times \text{Debt to Value } (D/V)\right] + \left[\text{Cost of Equity } (k_e) \times \text{Equity to Value } (E/V)\right]$$

$$\text{Cost of Equity } (k_e) = k_{wacc} + (k_{wacc} - k_d)\left(\frac{D}{E}\right)$$

where D/E is the ratio of debt to equity.

>> END FIGURE 15.3

Why Capital Structure Matters in Reality

In reality, financial managers care a great deal about how their firms are financed. Indeed, there can be negative consequences for firms that select an inappropriate capital structure, which means that, in reality, at least one of the two M&M assumptions is violated.

Violations of Assumption 2

Assumption 2 is clearly violated in reality. Transaction costs can be important, and, because of these costs, the rate at which investors can borrow may differ from the rate at which firms can borrow. When this is the case, firm values may depend on how firms are financed because individuals cannot substitute their individual borrowing for corporate borrowing to achieve a desired level of financial leverage. For example, if firms can borrow more cheaply than individuals, it might be better to have firms take on more financial leverage. This would increase both the risk and the return of their stocks and allow individuals who want to take substantial risk in their own portfolios to do so without borrowing. However, these violations of the M&M theorem provide very little in the way of insights regarding why some firms include much more debt in their capital structures than other firms because the transaction costs that cause differences between the borrowing rates faced by corporations and those faced by individuals tend to affect all firms equally.

Violations of Assumption 1 are much more fundamental and provide important insights regarding why different firms choose different capital structures. As we will discuss, the cash flows generated by firms are in fact influenced by how the firm is financed.

Violations of Assumption 1

Why might the extent to which the firm is financed by debt or equity affect the total after-tax cash flows generated by a firm? As we discuss here, there are three important reasons why the firm's capital structure affects the total cash flows available to its debt and equity holders:

1. Under the U.S. tax code, interest is a tax-deductible expense, whereas dividends paid to stockholders are not. Thus, after taxes, firms have more money to distribute to their debt and equity holders if they use more debt financing.[5]
2. Debt financing creates a fixed legal obligation. If the firm defaults on its payments, the creditors can force the firm into bankruptcy, and the firm will incur the added costs that this process entails.
3. The threat of bankruptcy can influence the behavior of a firm's executives as well as its employees and customers. On one hand, it can focus managerial attention on improving firm performance. On the other hand, too much debt can lead to changes that make a firm a less desirable employer and supplier.

Corporate Taxes and Capital Structure

In the United States, interest payments are tax-deductible, but dividend payments are not. So if the before-tax cash flows are unaffected by how the firm is financed, the after-tax cash flows will be higher if the firm's capital structure includes more debt and less equity.

To illustrate this effect, consider two firms that are identical in every respect except for their capital structure. Firm A uses no financial leverage and has total equity financing of $2,000. Firm B, on the other hand, has borrowed $1,000 on which it pays 5 percent interest and has raised the remaining $1,000 with equity. Each firm also has operating income of $200.00. The corporate tax rate on the firm's earnings is 25 percent. In this example, the income statements are as follows:

	Firm A	Firm B
Net operating income (EBIT)	$200.00	$200.00
Interest expense	0.00	(50.00)
Earnings before taxes	$200.00	$150.00
Income taxes	(50.00)	(37.50)
Net income	$150.00	$112.50

Note that Firm B pays $37.50 in taxes, which is $12.50 less than Firm A. This is a result of the fact that the $50 Firm B paid in interest is tax-deductible.

[5]This is not the case in all countries. The taxing authorities in a number of countries have changed their tax laws to reduce or eliminate the tax preference for debt financing.

Because Firm B incurs interest expenses, its after-tax net income is less than that of Firm A. To simplify our analysis, let's assume that both firms pay out 100 percent of their earnings in common stock dividends. By adding the total dividends paid to equity holders to the interest expense paid to the debt holders, we get the following:

	Firm A	Firm B
Equity dividends	$150.00	$112.50
Interest payments	0.00	50.00
Total distributions (to stockholders and bondholders)	$150.00	$162.50

Total distributions to the firm's owners (equity dividends) and to its creditors (interest payments) are only $150 for Firm A, whereas they are $162.50 for Firm B. The reason for the $12.50 difference can be traced directly to the fact that the $50 in interest payments is deductible from Firm B's taxable income and saves the firm .25 × $50 = $12.50 in taxes. We refer to the tax savings due to the tax deductibility of interest on the firm's debt as **interest tax savings**. These interest tax savings increase the total distributions Firm B can make to its stockholders without reducing the distribution to the debt holders and so add value to the firm and, in particular, to its stockholders. If the firm saves $12.50 in taxes every year, then the present value of these tax savings is the extra value added by using debt financing. In effect,

$$\begin{bmatrix}\text{Cash Flows to}\\ \text{a Firm with}\\ \text{Financial Leverage}\end{bmatrix} = \begin{bmatrix}\text{Cash Flows to}\\ \text{the Firm Without}\\ \text{Leverage}\end{bmatrix} + \begin{bmatrix}\text{Interest}\\ \text{Tax}\\ \text{Savings}\end{bmatrix} \quad \textbf{(15–8)}$$

This tax deductibility of interest expense leads firms to include more debt in their capital structures. In essence, corporate income taxes subsidize the firm's use of debt financing by allowing interest to be deducted before corporate taxes are calculated. So if a firm pays a tax rate of 25 percent, it gets a $0.25 tax refund for every dollar it pays in interest but gets nothing for the dividends it pays to the firm's common stockholders.

Corporate Taxes and the WACC. It is also the case that the tax deductibility of interest payments causes the firm's weighted average cost of capital to decline as it includes more debt in its capital structure. To illustrate this, consider the example found in Figure 15.4, where the cost of unlevered equity financing is assumed to be 10 percent and the cost of debt is 8 percent before taxes. If we assume a 40 percent tax rate, the after-tax cost of debt is 4.8 percent; that is, .08 × (1 – .4) = .048. As before, the cost of equity increases with the increased use of debt in the capital structure; however, with tax-deductible interest payments, the cost of equity increases less, as shown below:

$$\begin{matrix}\text{Cost of}\\ \text{Equity } (k_e)\end{matrix} = k_{\text{Unlevered equity}} + \left[(k_{\text{Unlevered equity}} - k_d)\left(\frac{D}{E}\right) \times (1 - \text{Tax Rate})\right] \quad \textbf{(15–9)}$$

Once again consider the cost of equity for a capital structure with 50 percent debt and 50 percent equity or a debt-to-equity ratio of 1.0. We calculate the cost of equity (levered equity because the firm is assumed to finance half the value of its assets using debt) as follows:

$$\begin{matrix}\text{Cost of}\\ \text{Equity } (k_e)\end{matrix} = .10 + (.10 - .08)(1.0) \times (1 - .40) = .112, \text{ or } 11.2\%$$

Substituting this result for the cost of equity in the formula for the weighted average cost of capital, we get the following:

$$k_{WACC} = \left[\begin{matrix}\text{Cost of}\\ \text{Debt } (k_d)\end{matrix}\left(1 - \begin{matrix}\text{Tax}\\ \text{Rate}\end{matrix}\right) \times \begin{matrix}\text{Debt to}\\ \text{Value } (D/V)\end{matrix}\right] + \left[\begin{matrix}\text{Cost of}\\ \text{Equity } (k_e)\end{matrix} \times \begin{matrix}\text{Equity to}\\ \text{Value } (E/V)\end{matrix}\right] \quad \textbf{(15–10)}$$

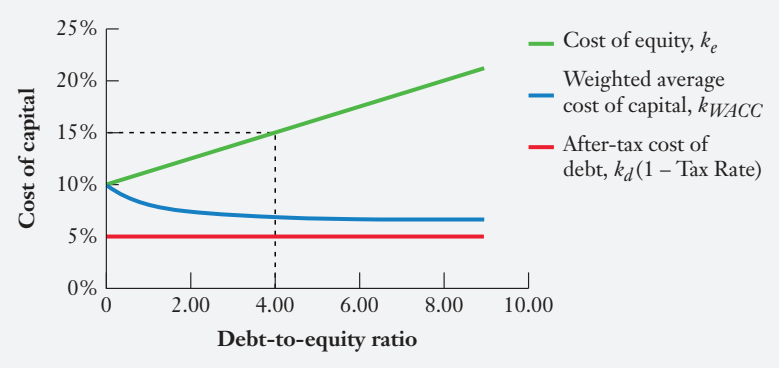
$$k_{WACC} = [.08(1 - .40) \times .50] + (.112 \times .50) = .08, \text{ or } 8\%$$

If we make similar calculations for different debt-to-equity ratios, we see that the firm's weighted average cost of capital declines as the debt ratio rises. For example, in Figure 15.4, we see that with a debt-to-equity ratio of 4 to 1, the cost of equity rises to 15 percent, but the

Figure 15.4

The Cost of Equity and the Weighted Average Cost of Capital with Tax-Deductible Interest Expense

Where interest expense is tax-deductible, there is a cost advantage to the use of debt financing. This, in turn, means that the value of the firm increases with the use of debt financing and, correspondingly, that the firm's weighted average cost of capital declines. In this figure, the cost of unlevered equity financing is 10%, and, assuming a 40% tax rate, the cost of debt is 8% before taxes and 4.8% after taxes: .08 × (1–.4) = .048.



Debt-to-Equity Ratio	After-Tax Cost of Debt	Cost of Equity	Weighted Average Cost of Capital
0.00	4.8%	10%	10.0%
0.11	4.8%	10%	9.6%
0.25	4.8%	10%	9.2%
0.43	4.8%	11%	8.8%
0.67	4.8%	11%	8.4%
1.00	4.8%	11%	8.0%
1.50	4.8%	12%	7.6%
2.33	4.8%	13%	7.2%
4.00	**4.8%**	**15%**	**6.8%**
9.00	4.8%	21%	6.4%

Legend:

$$k_{WACC} = \left[\text{Cost of Debt } (k_d)\left(1 - \text{Tax Rate}\right) \times \text{Debt to Value } (D/V)\right] + \left[\text{Cost of Equity } (k_e) \times \text{Equity to Value } (E/V)\right]$$

$$\text{Cost of Equity } (k_e) = k_{\text{Unlevered equity}} + \left[(k_{\text{Unlevered equity}} - k_d)\left(\frac{D}{E}\right)\right]$$

where $k_{\text{Unlevered equity}}$ is the cost of equity for a firm that uses no debt and D/E is the debt-to-equity ratio.

>> END FIGURE 15.4

k_{WACC} declines to 6.8 percent. Clearly, the tax deductibility of interest expense causes those setting capital structure policy to favor the use of debt over equity.[6]

Bankruptcy and Financial Distress Costs

If taxes were the only reason that capital structure affects cash flows, the firm would simply use enough debt financing to generate a tax deduction that is sufficient to eliminate its tax liability. However, the downside of using debt financing quickly becomes apparent when the firm's debt

[6]What about personal taxes? In general, personal taxes tend to favor equity financing. The individual tax rate on income that comes in the form of either a dividend or a capital gain upon the stock's appreciation is generally lower than the individual tax rate on interest income. Calculating the total tax benefits associated with debt financing is somewhat difficult because different individuals are subject to different tax rates that depend on the states in which they live as well as their incomes. However, because the majority of the equity for most large U.S. corporations is held by institutions that are not subject to corporate taxes, we can safely assume that at least for these firms the tax code favors debt financing.

obligations exceed its ability to generate cash. When this is the case, the firm will need to work out a deal with its bankers and bondholders to restructure its debt, or the firm might be forced into bankruptcy. In either case, a failure to meet its debt obligations can generate substantial costs to the firm, costs that we collectively refer to as **financial distress costs**.

For instance, consider what happens to Firm A and Firm B when the economy goes from rapid expansion to deep recession, as illustrated in Table 15.2. In Panel A, we see that even in a deep recession Firm A (which uses no debt financing) will have some, but very modest, earnings. In Panel B, we see that Firm B, on the other hand, will barely meet its debt obligations in a mild recession and will be unable to pay its interest obligations in the event of a deep recession.

In both a mild and a deep recession, Firm B will be subject to what economists call *deadweight costs*, which reduce the total amount of the cash flows that the firm can distribute to its debt and equity holders. These costs arise from the threat of bankruptcy, or what we will call *financial distress*, because the firm's financial troubles distract its managers, forcing them to spend their time negotiating with bankers rather than developing new products. They are also likely to generate large legal bills.

Being forced into bankruptcy is obviously costly to the firm, but it is also true that financial distress can cause problems for a firm long before the firm finds itself filing for bankruptcy. A firm that is close to bankruptcy is likely to be viewed by its customers and its suppliers as an unreliable business partner. As a result, it is likely to lose sales as customers seek out more reliable suppliers; it may find it difficult to get competitive quotes from its suppliers, who are increasingly worried about being repaid; and it may find it difficult to attract high-quality employees as prospective workers worry more about future layoffs.

Most financial managers will say that another important factor that limits their use of debt financing is that debt financing severely limits their flexibility. For example, if Firms A and B in Table 15.2 were to find themselves in a mild recession and also in need of funds to finance a new business opportunity, Firm B would find it very difficult to borrow more because it can barely pay the interest it owes on its existing debt. Firm A, on the other hand, has some financial slack in that it has $50 in operating earnings that is not obligated for the payment of interest. In this situation, Firm B's owners may also be unwilling to issue new shares, believing that in this depressed state of the economy the firm's shares are undervalued. As a result, they may have to pass up a profitable investment opportunity. Firm A, on the other hand, will be able to finance the investment. It has more of its cash flows available to be reinvested (because it is not obligated to pay a dividend), and, because it has no existing debt, it still has the ability to borrow.

The Tradeoff Theory and the Optimal Capital Structure

We have identified two factors that can have a material impact on the role of capital structure in determining firm value:

- **Interest expense is tax-deductible.** This fact makes the use of debt financing less costly and lowers the firm's WACC.
- **Debt makes it more likely that a firm will experience financial distress costs.** The contractual interest and principal payments that accompany the use of debt financing increase the likelihood that a firm will go into bankruptcy at some time in the future, which can lead to losses that reduce the cash flows of the firm.

When firms make financing decisions, they must trade off these positive and negative factors. On one hand, firms that have substantial amounts of taxable income they can eliminate by taking on debt and that face relatively modest risks of incurring the costs of financial distress will tend to choose relatively high debt ratios. On the other hand, firms that are not generating a lot of taxable income and that will be subject to substantial costs of financial distress if they have financial difficulties will want relatively low debt ratios.

Figure 15.5 contains a saucer-shaped cost-of-capital curve for a firm that trades off the benefits and costs of using debt. In this illustration, the tradeoff between the interest tax savings benefit of using more debt and the increasing expected costs of financial distress results in an optimal capital structure consisting of a debt-to-equity ratio of roughly 1 to 1, or a debt–to-firm value of 50 percent.

Table 15.2 Leverage and the Probability of Default

This example illustrates that the use of financial leverage increases the risk of financial distress. With debt financing, the firm is contractually obligated to pay interest and principal to the lender in accordance with the terms of the debt agreement (bond indenture). Consequently, the likelihood that the firm will default on its debt obligations increases as the firm increases the proportion of its capital structure that consists of debt financing. In this example, both firms have invested $2,000 in assets, with Firm A financing 100 percent of its assets using equity and Firm B financing $1,000 with equity and borrowing the remaining $1,000 at 5 percent.

(Panel A)	**Firm A (equity = 100% of assets or $2,000)**				
	Deep Recession	**Mild Recession**	**Normal**	**Mild Expansion**	**Rapid Expansion**
Probability	5%	20%	50%	20%	5%
Income Statement					
Net operating income (EBIT)	$ 10.00	$50.00	$100.00	$200.00	$300.00
Interest expense	0.00	0.00	0.00	0.00	0.00
Earnings before taxes	$ 10.00	$50.00	$100.00	$200.00	$300.00
Income taxes (25%)	(2.50)	(12.50)	(25.00)	(50.00)	(75.00)
Net income	$ 7.50	$37.50	$ 75.00	$150.00	$225.00
Return on equity (Net Income/Common Equity)	0.38%	1.88%	3.75%	7.50%	11.25%
Cash Distributions					
Equity dividends	$ 7.50	$37.50	$ 75.00	$150.00	$225.00
Interest payments	0.00	0.00	0.00	0.00	0.00
Total distributions	$ 7.50	$37.50	$ 75.00	$150.00	$225.00

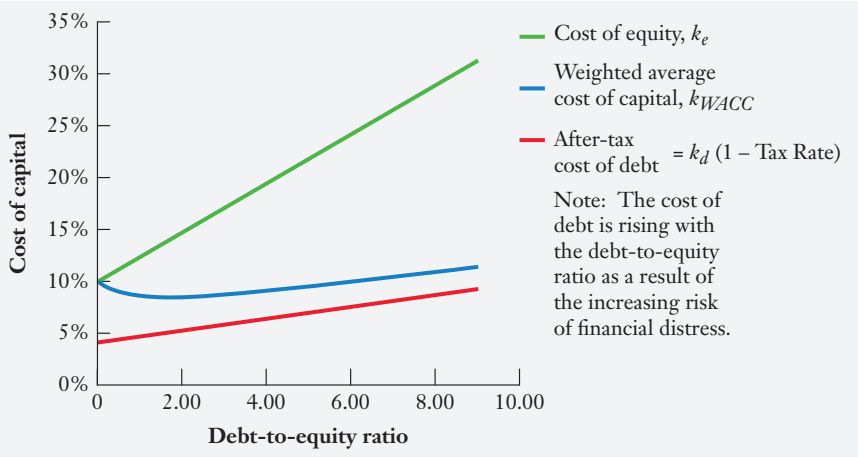
(Panel B)	**Firm B (equity = 50% of assets or $1,000)**				
	Deep Recession	**Mild Recession**	**Normal**	**Mild Expansion**	**Rapid Expansion**
Probability	10%	20%	40%	20%	10%
Income Statement					
Net operating income (EBIT)	$ 10.00	$ 50.00	$100.00	$200.00	$300.00
Interest expense	(50.00)	(50.00)	(50.00)	(50.00)	(50.00)
Earnings before taxes	$(40.00)	$ 0.00	$ 50.00	$150.00	$250.00
Income taxes (25%)[a]	0.00	0.00	(12.50)	(37.50)	(62.50)
Net income	$(40.00)	$ 0.00	$ 37.50	$112.50	$187.50
Return on equity	–4.00%	0.00%	3.75%	11.25%	18.75%
Cash Distributions					
Equity dividends	$ 0.00	$ 0.00	$ 37.50	$112.50	$187.50
Interest payments	10.00	50.00	50.00	50.00	50.00
Total distributions	$ 10.00	$50.00	$ 87.50	$162.50	$237.50

[a] We simplify the tax treatment of income in this example by ignoring the carryforward/carryback provision of the tax code that would allow a firm that suffered losses to carry those losses back to reduce taxes paid in a prior period (or carry the losses forward to reduce its taxes in a future period). For example, in Panel B when the deep recession state is experienced, the firm has a ($40.00) taxable loss that can be used to reduce taxable income from a prior period or a future period and save the firm 25% of the loss in taxes, or $10.

Figure 15.5

The Cost of Capital and the Tradeoff Theory

The tradeoff theory says that the tax savings benefits of debt financing drive down the firm's WACC over reasonable ranges of the debt-to-equity ratio. However, as the firm issues more and more debt, the expected costs of bankruptcy begin to rise, which, in turn, increases the cost of debt. This increase in the cost of debt can offset the tax savings benefits of debt, eventually causing the WACC to increase.



>> END FIGURE 15.5

Capital Structure Decisions and Agency Costs

As we discussed in Chapter 1, public corporations are managed by professional managers who do not own all the shares of the firms they manage. As we learned from examples of P Principle 5: **Individuals Respond to Incentives**, if the managers who control the firm's operations own only a small fraction of its shares, their self-interest will not always be the same as the interests of the stockholders who own the majority of the firm's shares. When this is the case, the managers may make choices that are not in the shareholders' interests, resulting in what economists call **agency costs**. It is sometimes possible to reduce these agency costs through the use of debt financing. For example, it is often argued that managers of firms that have high levels of cash flows tend to become complacent about controls over spending that cash and may engage in wasteful spending practices such as buying expensive company buildings, airplanes, and so forth. Corporate executives may also invest in new lines of business that provide opportunities for themselves and their employees but that may not be particularly profitable for the firm's stockholders.

One way to limit these choices and to get managers to focus more narrowly on stockholder interests is to increase the firm's debt obligations, thereby reducing the firm's discretionary control over its cash flow. For example, in 2009 a financially distressed Citigroup canceled the delivery of a new corporate jet. As we discussed previously, financial distress generally has negative consequences; however, the threat of financial distress can provide a source of discipline that restrains managers who might otherwise make choices that are not in their shareholders' best interests.

Making Financing Choices When Managers Are Better Informed than Shareholders

Up until now, we have assumed that a firm and its investors agree about the fundamental values of the firm's debt and equity. In reality, this may not be the case. Indeed, it is not at all

uncommon for managers of companies to believe that their share price is too low, and when this is the case, they may be reluctant to issue new shares. For many smaller closely held companies, this unwillingness to issue what they perceive as underpriced shares is compounded by the fact that issuing shares often means sharing control. For both of these reasons, firms often prefer to raise external capital with debt rather than equity.

This preference for raising external debt is compounded by the fact that investors tend to be skeptical of the motives of firms that issue new shares. As a result, when a firm does issue shares, it is often seen as a signal that the firm's stock is overpriced. Indeed, when a firm announces its intention to issue equity, its share price generally falls.

MIT financial economist Stewart Myers suggested that because of the information issues that arise when firms issue equity, firms tend to adhere to the following pecking order when they raise capital:

- The firm first relies on **internal sources of financing**, or the retention of the firm's earnings. If the firm generates more cash than is needed to fund its investments, the cash will be used to repay debt, purchase marketable securities, or repurchase some of the firm's stock.
- When internally generated cash flows fall short of the firm's need for funds, the firm will use its available cash balances and raise additional cash by selling short-term debt securities.
- If the firm's cash and marketable securities are insufficient to meet the firm's financial requirements, then the firm will begin issuing securities, beginning with the safest security it can sell, which is debt. The firm will sell debt up until the point where either the costs are prohibitive or the debt puts the firm at serious risk of default.
- Next, the firm will sell hybrid securities such as convertible bonds, and then, as a last resort, it will sell equity to the public markets.

Managerial Implications

Our brief overview of capital structure theory has revealed the following important learning points:

1. Higher levels of debt in its capital structure can benefit a firm for two reasons: First, interest on the firm's debt is tax-deductible, whereas dividends to common stock are not, and, second, the use of debt financing can sometimes help align the incentives of managers with those of shareholders.
2. Higher levels of debt in its capital structure increases the probability that a firm will become financially distressed or bankrupt. There are costs to the firm from financial distress and bankruptcy that offset the tax and incentives benefits of debt.

The fact that managers tend to be better informed about the value of their firms tends to reduce the frequency of equity issues. This occurs because managers are reluctant to issue equity when they believe that their shares are underpriced. In addition, because investors understand that managers have an incentive to issue stock when it is overpriced, announcements of equity issues generally result in a decline in share prices.

This relationship is presented graphically in Figure 15.6. Here we see that the tax shield effect is dominant until point A is reached. After point A, the rising costs of the likelihood of firm failure (financial distress) and agency costs cause the market value of the levered firm to decline. The objective for the financial manager is to find point A by using all of his or her analytical skills; this effort must also include a good dose of seasoned judgment. At point A, the actual market value of the levered firm is maximized, and the firm's weighted average cost of capital is at a minimum.

Figure 15.6

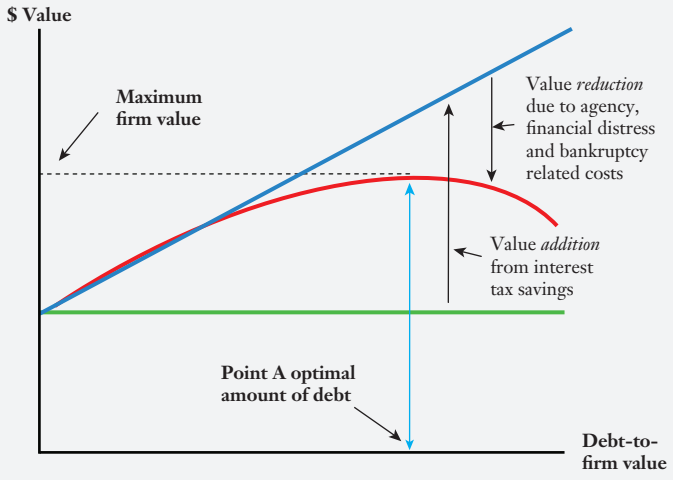
Capital Structure and Firm Value with Taxes, Agency Costs, and Financial Distress Costs

This figure considers the value of the firm in three different scenarios, with Scenario 3 being the most realistic because it incorporates the added value of the interest tax savings as well as the costs of financial distress, bankruptcy, and agency that go along with the use of debt.

Scenario 1—the green horizontal line. In this scenario, the M&M capital structure theorem holds, so firm value is not affected by the level of debt.

Scenario 2—the blue upward-sloping line. In this scenario, debt payments are tax-deductible, but there are no agency, bankruptcy, and financial distress costs.

Scenario 3—the hump-shaped red line. In this scenario, debt influences firm value because of interest tax savings as well as the costs of agency, bankruptcy, and financial distress. In this last scenario, the optimal amount of debt for the firm is found where firm value is maximized.



>> END FIGURE 15.6

Before you move on to 15.3

Concept Check | 15.2

1. Who were the financial economists that in 1958 challenged the importance of capital structure management? What is the essence of their theory of capital structure?
2. Discuss the role of the following factors in the firm's capital structure decision: taxes, bankruptcy costs, managerial incentives, and how well informed managers are compared to stockholders.

15.3 Why Do Capital Structures Differ Across Industries?

Recall that in Figure 15.1 we showed that firms in different industries can have very different capital structures. For example, firms in the computer software industry tend to use very little debt in their capital structures, whereas firms in the casino and gaming industry tend to use much more financial leverage.

To understand these differences, we need to think carefully about the costs and benefits associated with including more debt in a firm's capital structure. Let's consider first the importance of corporate taxes, which lower the cost of debt financing relative to equity financing because interest is tax-deductible and dividends paid to stockholders are not. Firms in some industries, such as electricity and gas utilities and casinos, tend to generate lots of taxable income, and, consequently, the likelihood that they will reap the benefit of the tax deductibility of interest payments is very high. However, in industries such as computer software, firms have very little taxable income because of the large expenses associated with developing computer code as well as other research and development expenses. For these firms, the tax benefits of financial leverage are less certain, and, consequently, there will be less to gain from increasing their use of financial leverage.

Financial distress and bankruptcy costs also differ in importance across industries. For a computer and software firm such as Apple (APPL), financial distress could be devastating. Customers would be very reluctant to buy an Apple computer with its proprietary operating system if they believed that Apple may not stay in business. For similar reasons, Apple would find it difficult to attract the best programmers if it were financially distressed. It is sometimes said that the "scent of death" can kill a company. Although this applies to software firms, it does not apply equally to all firms. For example, you probably would not hesitate to enter a casino or stay at a hotel because of concerns about the financial health of the company. These firms can take on lots of debt without jeopardizing the viability of their businesses.

Although we tend to observe firms with lower financial distress costs and higher tax gains using more debt financing than firms with higher financial distress costs and lower tax gains, there are a number of exceptions to this general rule. In particular, there are a number of firms with capital structures that include very little debt even though they could benefit from the tax deductibility of interest payments and would increase the potential for financial distress costs very little. The incentive issues that we described earlier provide perhaps the most plausible explanation for these firms. The values of these firms would probably increase if they took on more financial leverage, but their top executives may personally prefer operating their businesses in a less risky environment with less debt.

Before you move on to 15.4

Concept Check | 15.3

1. What are some reasons for firms in different industries to have different capital structures?

15.4 Making Financing Decisions

We have just learned that there can be costs and benefits associated with including more debt in a firm's capital structure. To determine the optimal capital structure for the firm, the financial manager must weigh these benefits and costs to come up with an appropriate level of debt. As part of this process, the financial manager will typically compare the firm's capital structure to that of similar firms. In addition, the financial manager will consider the effect of financing alternatives on the level and volatility of the firm's reported earnings per share (EPS) and also on its risk of default.

Benchmarking the Firm's Capital Structure

When **benchmarking** a firm's capital structure, we compare the firm's current and proposed capital structures to those of a set of firms that are considered to be in similar lines of business and, consequently, subject to the same types of risks. For example, we might compare the capital structure of Home Depot to that of Lowe's, but we probably would not compare it to that of Dell Computers.

The objective of benchmarking is not to simply copy what the firm's competitors are doing. Instead, we use benchmarking to determine a starting point for our analysis. For example, consider the situation where the firm being analyzed currently has a debt ratio of 45 percent and raising additional funds with debt will push the debt ratio to 50 percent. If other firms in similar businesses all have debt ratios less than 30 percent, we will probably want to be extremely cautious about engaging in additional borrowing. In other words, we will want to perform a detailed analysis of the impact of the financing choice on the level and volatility of the firm's EPS and on its risk of default.

Table 15.3 contains a simple template for the type of benchmarking comparisons the financial analyst will want to make. In the template, we include both the debt ratio (total liabilities divided by total assets) and the **interest-bearing debt ratio** (interest-bearing debt divided by total assets) as measures of how the firm has financed its assets. The former ratio includes all of the firm's liabilities in the numerator, whereas the latter includes only those liabilities (debts) that are interest-bearing. The latter includes such things as bank loans, bonds, and other types of debt on which an explicit interest payment must be made by the borrower

Table 15.3 Worksheet for Benchmarking When Making a Capital Structure Decision

Benchmarking is a tool for analyzing financing alternatives that simulates the effects of these alternatives on the firm's financial ratios. The benchmarking process involves calculating a set of financial leverage ratios for the firm under three scenarios: (1) prior to any new financing episode (the firm as it exists today), (2) with common equity financing, and (3) with debt financing. The resulting ratios are then compared to these same ratios for similar firms.

Two types of financial ratios are typically used: balance-sheet-based measures of the extent to which debt financing has been used by the firm (i.e., the debt ratio and interest-bearing debt ratio found below) and coverage ratios, which indicate the ability of the firm to meet the financial requirements of its debt (i.e., the interest earned ratio and the EBITDA coverage ratio found below). These financial leverage ratios are then compared to the financial leverage ratios of similar firms (the final column).

Ratio	Formula	Existing Ratio	Ratio with Common Stock Financing	Ratio with Debt Financing	Comparison Ratios for Similar Firms
Debt ratio	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	_____%	_____%	_____%	_____%
Interest-bearing debt ratio	$\frac{\text{Interest-Bearing Debt}}{\text{Total Assets}}$	_____%	_____%	_____%	_____%
Times interest earned	$\frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}}$	_____ times	_____ times	_____ times	_____ times
EBITDA coverage ratio	$\frac{\text{Earnings Before Interest and Taxes} + \text{Depreciation Expense} + \text{Amortization Expense}}{\text{Interest Expense} + \left(\frac{\text{Principal Payments}}{1 - \text{Tax Rate}}\right)}$	_____ times	_____ times	_____ times	_____ times

to the lender. Specifically excluded are the firm's non-interest-bearing liabilities such as accounts payable and accrued expenses that do not have an explicit interest expense.[7] The only difference in these two ratios is the fact that the latter restricts the definition of debt to debt on which explicit interest payments must be made.

Table 15.3 also includes two measures of the firm's ability to pay the interest and principal on its debt. The first measure is the times interest earned ratio, which is equal to the ratio of the firm's net operating income or EBIT to interest expense. The second ratio is the **EBITDA coverage ratio**. This latter ratio differs from the times interest earned ratio in both its numerator, which adds noncash charges such as depreciation and amortization back to EBIT, and its denominator, which includes not only interest expense but also the principal repayments the firm is obligated to make. Note that the principal payments are "grossed up" to reflect the fact that they are paid using after-tax earnings, whereas interest expense is paid before taxes are paid. Thus, assuming that the firm must make a $100,000 principal payment, it will have to earn $100,000 ÷ (1 – Tax Rate). For example, if the tax rate is 40 percent, the firm will have to earn $100,000 ÷ (1 – .40) = $166,666.67 before taxes in order to have the needed $100,000 to repay the principal on its debt.

Evaluating the Effect of Financial Leverage on Firm Earnings per Share

The firm's capital structure decisions affect both the level and the volatility of the firm's reported EPS. Firms that use more debt financing, all else equal, will experience greater swings in their EPS in response to changes in firm revenues and operating earnings. This is generally referred to as the **financial leverage effect**.

[7]For example, when a firm purchases items for its inventories from one of its suppliers, the credit terms might simply require that the amount of credit extended be repaid in 90 days. We would expect that the price of the items purchased would include an implicit charge for the 90-day period for which credit is extended. However, because no explicit rate of interest is stated, we cannot separate out the cost of credit from the pricing of the items purchased.

Checkpoint 15.1

Benchmarking a Financing Decision

Sister Sarah's Homemade Pies, Inc., is a rapidly growing manufacturer and distributor of frozen pastries and desserts. The company was founded in 1995 by Sarah Goodnight, who used old family recipes and southern home-style cooking to prepare a wide variety of desserts. By 2016, the business had grown to the point that it was expected to produce $50 million in revenues based on total assets of $29.8 million. The firm has outgrown its manufacturing facility and is planning to invest $10 million in a new, modern plant. With the added capacity of the new plant, the firm expects to increase its revenues from $50 million to $60 million per year. In addition, the 20 percent increase in revenues will be accompanied by a 20 percent increase in the cost of goods sold and operating expenses. The new equipment will be depreciated over a 10-year life and result in $1 million in additional depreciation expense per year (amortization expenses are zero). The firm pays a 30 percent tax rate.

Two financing alternatives are being considered. The first involves issuing 1.342 million shares of common stock, and the second involves borrowing the entire $10 million ($2 million in additional short-term debt and $8 million in additional long-term debt). The firm currently owes $6 million in combined short- and long-term debt on which it pays 8 percent interest and makes principal payments of $1.2 million a year. If the debt option is selected, the firm will pay 8 percent interest on the added $10 million in short- plus long-term debt and in addition will make principal payments of $2 million per year on the new debt until the note is repaid.

How will the financial ratios of Sister Sarah's Homemade Pies, Inc. change if the firm uses the equity alternative? What about the debt alternative?

STEP 1: Picture the problem

The firm's 2016 balance sheet, which does not reflect the added $10 million, and pro forma balance sheets that reflect the equity and debt financing options are as follows:

		Pro Formas Adjusted for New Financing	
	2016	Equity	Debt
Accounts payable	$ 4,500,000	$ 4,500,000	$ 4,500,000
Short-term debt	$ 1,200,000	$ 1,200,000	$ 3,200,000
Total current liabilities	$ 5,700,000	$ 5,700,000	$ 7,700,000
Long-term debt	4,800,000	4,800,000	12,800,000
Common equity	19,300,000	29,300,000	19,300,000
Total	$29,800,000	$39,800,000	$39,800,000

The firm's 2016 income statement and pro forma income statements that reflect the equity and debt financing options are as follows:

		Pro Formas Adjusted for New Financing	
	2016	Equity	Debt
Revenues	$ 50,000,000	$ 60,000,000	$ 60,000,000
Cost of goods sold	(25,000,000)	(30,000,000)	(30,000,000)
Gross profit	$ 25,000,000	$ 30,000,000	$ 30,000,000
Operating expenses	(10,000,000)	(12,000,000)	(12,000,000)
Depreciation expense	(2,000,000)	(3,000,000)	(3,000,000)
Net operating income (EBIT)	$ 13,000,000	$ 15,000,000	$ 15,000,000
Interest expense	(480,000)	(480,000)	(1,280,000)
Earnings before taxes	$ 12,520,000	$ 14,520,000	$ 13,720,000
Income taxes	(3,756,000)	(4,356,000)	(4,116,000)
Net income	$ 8,764,000	$ 10,164,000	$ 9,604,000

STEP 2: Decide on a solution strategy

Table 15.3 provides a useful template for presenting four key financial leverage ratios that can be used to benchmark the firm against others in the industry.

STEP 3: Solve

Calculating the four benchmark financial ratios found in Table 15.3, we get the following:

Ratio	Formula	Existing Ratio	Ratio with Common Stock Financing	Ratio with Debt Financing
Debt ratio	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	35.2%	26.4%	51.5%
Interest-bearing debt ratio	$\frac{\text{Interest-Bearing Debt}}{\text{Total Assets}}$	20.1	15.1	40.2
Times interest earned	$\frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}}$	27.08	31.25	11.72
EBITDA coverage ratio	$\frac{\text{Earnings Before Interest and Taxes} + \text{Depreciation Expense} + \text{Amortization Expense}}{\text{Interest Expense} + \left(\frac{\text{Principal Payments}}{1 - \text{Tax Rate}}\right)}$	6.84	8.20	3.08

STEP 4: Analyze

Whether the entire $10 million is raised by issuing equity or by borrowing has a dramatic effect on the firm's capital structure. For example, the debt ratio will either drop from 35.2 percent to 26.4 percent if equity is used or increase to 51.5 percent if debt is used. The interest-bearing debt ratio will change in a similar manner, dropping from 20.1 percent to 15.1 percent if equity financing is used and rising to 40.2 percent if debt financing is used. The times interest earned ratio will rise slightly from 27.08 to 31.25 with an equity offering but will drop to only 11.72 with a debt offering. The EBITDA coverage ratio, which incorporates consideration of noncash expenses (depreciation) in the numerator as well as the repayment of principal in the denominator, will increase to 8.20 from 6.84 if equity is used and fall to 3.08 if debt is used.

To complete our benchmark analysis, we need to compare the above leverage ratios to the following comparable firm ratios:

	Comparable Firm Ratio
Debt ratio	40%
Interest-bearing debt ratio	30%
Times interest earned ratio	22 times
EBITDA coverage ratio	6 times

Benchmarking Sister Sarah's capital structure against these norms, it is apparent that the debt alternative is a more aggressive use of debt financing than is the norm for the industry. Notice that we are evaluating the impact of the financing decision on the firm only for the year in which the financing is raised. Because the debt will be repaid according to the debt agreement, these ratios will improve over time. Specifically, the firm will pay down $2 million per year of the new debt in 2017 in addition to $1.2 million of the firm's existing debt. Consequently, we need to think beyond the current year when making the financing decision. Ultimately, the decision of whether or not to use more debt cannot be made based solely on the benchmark comparison to industry norms. For example, Sister Sarah's managers may be sufficiently confident about the firm's future earnings prospects that they feel they can afford the higher use of debt financing today.

STEP 5: Check yourself

Under the debt financing alternative, what will Sister Sarah's financial ratios look like in just two years after the firm has repaid $4 million of the loan (assuming nothing else changes)? (Hint: Subtract $4 million in long-term debt on the balance sheet for the debt financing alternative.)

ANSWER: The debt ratio is 46.1 percent, the interest-bearing debt ratio is 33.5 percent, the times interest earned ratio is 15.63, and the EBITDA coverage ratio is 4.10.

Your Turn: For more practice, do related **Study Problems** 15–1, 15–3, 15–5, 15–9, at the end of this chapter.

>> END Checkpoint 15.1

Let's take a look at how financial leverage works. The founders of a newly formed business venture, the House of Toast, Inc., estimate that the firm will need $200,000 to purchase the assets needed to get the business up and running. The company founders are considering the three possible financing plans:

- **Plan A.** No financial leverage is used. Instead, the entire $200,000 is raised by selling 2,000 common shares for $100 each.
- **Plan B.** Moderate financial leverage equal to 25 percent of the assets ($50,000) is borrowed using a debt issue that carries an 8 percent interest rate and requires the payment of annual interest. The remaining $150,000 is raised through the sale of 1,500 shares of common stock at a price of $100 per share.
- **Plan C.** Even more financial leverage is used in this plan, as $80,000 of the $200,000 needed is borrowed (40 percent). The debt issue carries an interest rate of 8 percent and requires the payment of annual interest. The remaining $120,000 is raised by selling 1,200 shares of common stock for $100 per share.

Table 15.4 contains the balance sheets for the House of Toast, Inc., under each financing plan.

Financial Leverage and the Level of EPS

Financial leverage can sometimes make a firm's EPS higher and at other times lower. The key determinant of the effect of financial leverage on the level of EPS is the rate of return earned by the firm on its assets. For example, if the firm is borrowing at 8 percent and earns 10 percent on the borrowed money, then the additional 2 percent that the firm earns over the cost of borrowing goes to the common shareholders. This increases both the rate of return earned on the common shareholders' equity and the EPS. When this happens, the firm is said to benefit from the use of *favorable* financial leverage because the use of debt financing results in higher EPS and an increase in the firm's return on equity.

To illustrate the effect of financial leverage on a firm's EPS and its return on equity, consider the three capital structure plans described earlier for the House of Toast, Inc. In this example, the firm experiences operating earnings of $10,000 (in what the firm's CFO estimates to be a worst-case scenario) and $40,000 (in what the CFO estimates to be a best-case scenario). As shown in Table 15.5, in the worst-case scenario the firm earns only 5 percent on its investments, and because it has to pay 8 percent interest on its debt, financial leverage reduces firm EPS—if the firm takes either Plan B or Plan C—below what it would achieve if

Table 15.4 Alternative Financial Structures Being Considered by the House of Toast, Inc.

PLAN A: 0% DEBT			
		Total debt	$ 0
		Common equity	200,000[a]
Total assets	$200,000	Total liabilities and equity	$200,000
PLAN B: 25% DEBT AT 8% INTEREST RATE			
		Total debt	$ 50,000
		Common equity	150,000[b]
Total assets	$200,000	Total liabilities and equity	$200,000
PLAN C: 40% DEBT AT 8% INTEREST RATE			
		Total debt	$ 80,000
		Common equity	120,000[c]
Total assets	$200,000	Total liabilities and equity	$200,000

[a] 2,000 common shares outstanding.

[b] 1,500 common shares outstanding.

[c] 1,200 common shares outstanding.

Table 15.5 Structure and Level of EPS for the House of Toast, Inc.

This example illustrates the effect of the use of financial leverage on a firm's EPS and return on common equity. The important thing to note here is that the use of financial leverage magnifies the effects of increases and decreases in the firm's operating income on EPS and return on common equity.

	Plan A: 0% Debt		Plan B: 25% Debt		Plan C: 40% Debt	
Common shares	2,000		1,500		1,200	
Debt financing	$ 0		$ 50,000		$80,000	
	Worst Case	**Best Case**	**Worst Case**	**Best Case**	**Worst Case**	**Best Case**
Operating return on assets	5%	20%	5%	20%	5%	20%
Net operating income (EBIT)	$ 10,000	$40,000	$10,000	$40,000	$10,000	$40,000
Interest expense	0	0	(4,000)	(4,000)	(6,400)	(6,400)
Earnings before taxes	$ 10,000	$40,000	$ 6,000	$36,000	$ 3,600	$33,600
Income taxes	(5,000)	(20,000)	(3,000)	(18,000)	(1,800)	(16,800)
Net income	$ 5,000	$20,000	$ 3,000	$18,000	$ 1,800	$16,800
EPS	$ 2.50	$ 10.00	$ 2.00	$ 12.00	$ 1.50	$ 14.00
Return on equity	2.5%	10.0%	2.0%	12.0%	1.5%	14.0%
Assumptions:			**Legend:**			
Total assets	$200,000		Operating return on assets = EBIT/Total assets			
Share price	$ 100.00					
Borrowing rate	8%		EPS = Net income/Shares outstanding			
Corporate tax rate	50%		Return on equity = Net income/Common equity			

it used the all-equity plan (Plan A). However, in the best-case scenario where the firm earns a return on assets of 20 percent (EBIT/Total Assets = $40,000/$200,000), Plans B and C provide higher EPS and higher rates of return on equity than the all-equity plan.

Financial Leverage and the Volatility of EPS

Table 15.5 also illustrates the impact of financial leverage on the volatility of EPS. For example, consider the following summary of the effect of increasing EBIT from $10,000 to $40,000 on the EPS of capital structure Plans A, B, and C:

Capital Structure	Worst Case EBIT = $10,000	Best Case EBIT = $40,000	$ Change in EPS	% Change in EPS
Plan A	$2.50	$10.00	$ 7.50	300%
Plan B	2.00	12.00	10.00	**500%**
Plan C	1.50	14.00	12.50	833%

% Change in EPS for Plan B is calculated as follows:
$\frac{\$12 - 2}{\$2} = 5$ or 500%

The $30,000 or 300 percent increase in EBIT from the worst- to best-case scenario results in a 300 percent increase in EPS under Plan A, which has no financial leverage. However, the same increase in EBIT results in a 500 percent increase in the firm's EPS under Plan B and an 833 percent increase under Plan C. *The key learning point here is that increasing financial leverage, holding everything else the same, leads to greater volatility in EPS.*

What happens if the direction of the change in EBIT is reversed? In other words, what if EBIT drops from $40,000 to only $10,000? As this example illustrates, financial leverage is a double-edged sword in that it works in both the positive and the negative directions—in effect, demonstrating P Principle 2: **There Is a Risk-Return Tradeoff**. When EBIT is high, a more levered firm will realize higher EPS. However, if EBIT falls, a firm that uses more financial leverage will suffer a larger drop in EPS than a firm that relies less on financial leverage.

Using the EBIT-EPS Chart to Analyze the Effect of Capital Structure on EPS

The **EBIT-EPS chart** (sometimes called the **range of earnings chart**) is the principal tool used to evaluate the effects of capital structure choices on earnings per share. To illustrate how this tool can be used, consider the two financing alternatives faced by the House of Toast, Inc., in Checkpoint 15.2. The first thing you will want to consider is whether the debt plan produces a higher level of EPS for the most likely range of EBIT values that you expect in the future. The next thing to consider is the possible swings in EPS that might occur under the capital structure alternatives.

Checkpoint 15.2

Evaluating the Effect of Financing Decisions on EPS

The House of Toast, Inc., is considering a new investment that will cost $50,000 and that will increase the firm's annual operating earnings (EBIT) by $10,000 per year from the current level of $20,000 to $30,000. The firm can raise the $50,000 by (1) selling 500 shares of common stock at $100 each or (2) selling bonds that will net the firm $50,000 and carry an interest rate of 8.5 percent. What is the EPS for the expected level of EBIT equal to $30,000? What are the effects of the financing alternatives on the level and volatility of the firm's EPS if the firm anticipates that its EBIT will fall within the range of $20,000 to $40,000 per year?

STEP 1: Picture the problem

The current and prospective capital structure alternatives can be described using pro forma balance sheets as follows:

Existing Capital Structure		With New Common Stock Financing		With New Debt Financing	
Long-term debt at 8%	$ 50,000	Long-term debt at 8%	$ 50,000	Long-term debt at 8%	$ 50,000
Common stock	150,000	Common stock	200,000	Long-term debt at 8.5%	50,000
				Common stock	150,000
Total liabilities and equity	$200,000	Total liabilities and equity	$250,000	Total liabilities and equity	$250,000
Common shares outstanding	1,500	Common shares outstanding	2,000	Common shares outstanding	1,500

STEP 2: Decide on a solution strategy

A firm's capital structure choice will affect both the level of EPS for a given level of operating earnings (EBIT) and the volatility of changes in EPS corresponding to changes in EBIT. To analyze both of these attributes of the problem, we use pro forma income statements for the range of levels of EBIT that the firm believes is relevant to its future performance.

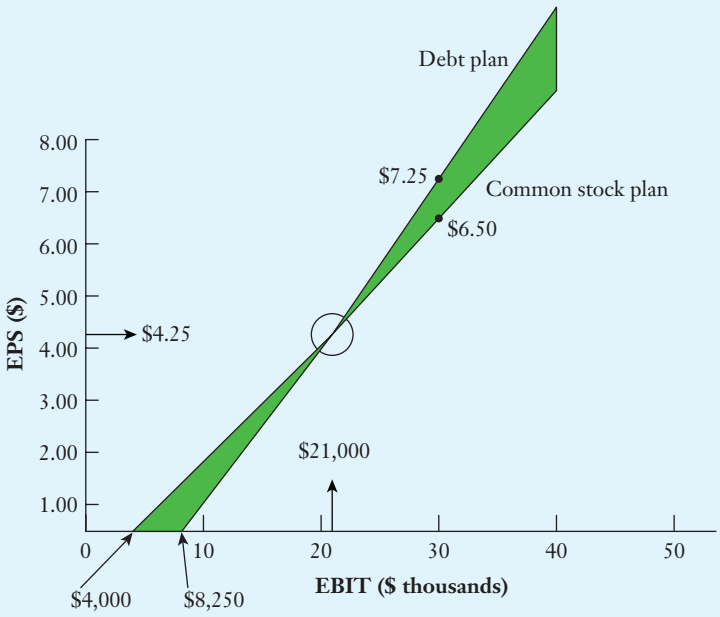
STEP 3: Solve

Pro forma income statements for the two financing alternatives evaluated at the projected EBIT level of $30,000 reveal that EPS for the common stock and debt alternatives are $6.50 and $7.25, respectively.

	Existing Capital Structure	With New Common Stock Financing	With New Debt Financing
Net operating income (EBIT)	$20,000	$30,000	$ 30,000
Interest expense	(4,000)	(4,000)	(8,250)
Earnings before taxes	$16,000	$26,000	$ 21,750
Income taxes (50%)	(8,000)	(13,000)	(10,875)
Net income	$ 8,000	$13,000	$ 10,875
Preferred dividends	0	0	0
Net income	$ 8,000	$13,000	$ 10,875
Common shares outstanding	1,500	2,000	1,500
EPS = Net income/Common shares outstanding	$ 5.33	$ 6.50	$ 7.25

Figure 15.7

EBIT-EPS Chart for the House of Toast, Inc., Under New Financing Alternatives



EBIT	Earnings per Share: Common Stock Financing	Earnings per Share: Debt Financing
$ 4,000	0	(1.42)
8,250	1.06	0
20,000	**4.00**	**3.92**
21,000	4.25	4.25
30,000	6.50	7.25
40,000	**9.00**	**10.58**

>> END FIGURE 15.7

Both are considerably above the $5.33 EPS the firm will earn if the new project is rejected and the additional financial capital is not raised. If the firm selects the financing plan that will provide the highest EPS, the debt alternative is clearly favored. However, debt (bond) financing increases the risk of the returns to the equity investors. That is, changes in the firm's EBIT cause bigger changes in the firm's EPS where debt financing is used. To analyze this issue, we calculate the EPS that will be earned under the equity financing and debt financing plans over a range of EBIT corresponding to the CFO's estimates of what the firm might actually earn (which are $20,000 to $40,000). We plot these EPS estimates for each of the capital structures in the EBIT-EPS chart in Figure 15.7.

For EBIT of $20,000, EPS are $3.92 for the debt financing alternative and $4.00 for the equity financing alternative. If EBIT is equal to $40,000, however, the debt plan produces $10.58 in EPS compared to only $9.00 for the equity plan. In fact, for EBIT levels above $21,000, EPS for the debt financing alternative are greater than EPS for the equity financing alternative.

STEP 4: Analyze

Within the range of $21,000 to $40,000 for EBIT, the House of Toast can expect that the debt plan will provide the same or higher (but more volatile) EPS for the firm. The added volatility in EPS for the debt alternative is evidenced in the steepness of the EBIT-EPS line corresponding to the debt financing plan in Figure 15.7. For example, a decrease in EBIT from $40,000 to $20,000 results in a drop in EPS for the debt plan from $10.58 to $3.92 (or –63 percent), whereas the corresponding drop in EPS for the equity plan is from $9.00 to $4.00 (or –56 percent). So, even though the debt plan offers higher EPS for the majority of the anticipated range of EBIT ($20,000 to $40,000), it will result in more volatile changes in EPS when EBIT changes from year to year.

STEP 5: Check yourself

House of Toast likes the new investment very much. However, in the weeks since the project was first analyzed, the firm has learned that credit tightening in the financial markets has caused the cost of the debt to increase to 10 percent. What level of EBIT produces zero EPS for the new borrowing rate?

ANSWER: EBIT = $9,000.

Your Turn: For more practice, do related **Study Problem** 15–12 at the end of this chapter.

>> END Checkpoint 15.2

Computing EPS Indifference Points for Capital Structure Alternatives

The point of intersection of the two capital structure lines found in Figure 15.7 is sometimes called the **EBIT-EPS indifference point**. This point identifies the EBIT level at which EPS will be the same, regardless of the financing plan chosen by the firm. This indifference point has major implications for financial planning. At EBIT amounts in excess of the EBIT indifference level, the financing plan with *more* leverage will generate higher EPS. At EBIT amounts below the EBIT indifference level, the financing plan with *less* leverage will generate higher EPS.

We can find the EBIT indifference level graphically, as shown in Figure 15.7, or by using the following equation:

$$\frac{\underline{\text{EPS for the Stock Plan}}}{(EBIT - \text{Interest Expense}_{\text{Stock plan}})(1 - \text{Tax Rate})} = \frac{\underline{\text{EPS for the Bond Plan}}}{(EBIT - \text{Interest Expense}_{\text{Bond plan}})(1 - \text{Tax Rate})} \quad \textbf{(15–11)}$$
$$\text{Shares Outstanding (Stock Plan)} \qquad \text{Shares Outstanding (Bond Plan)}$$

For the present example, we calculate the indifference level of EBIT using Equation (15–11) as follows:

$$\frac{(EBIT - \$4{,}000)(1 - .50)}{2{,}000} = \frac{(EBIT - \$8{,}250)(1 - .50)}{1{,}500}$$

When the expression above is solved for EBIT, we see that when EBIT is $21,000, then EPS will be $4.25 under both plans. If EBIT exceeds $21,000, then the debt plan produces higher EPS than the equity plan; if EBIT is lower than $21,000, then the equity plan produces higher EPS than the debt plan.

Before concluding this section, it should be noted that managers do tend to be very aware of how their capital structure choices affect their firm's EPS. However, our discussion of capital structure theory taught us that EPS should not be the primary driver of a firm's capital structure choice. Thus, the type of analysis considered in this section must be used in conjunction with other basic tools in reaching the objective of capital structure management.

Can the Firm Afford More Debt?

In our earlier discussion, we described the firm's financial structure as either the relative proportion of debt used to finance the firm's total assets, or the debt ratio (Equation [15–1]), or the debt-to-enterprise-value ratio (Equation [15–3]). These ratios tell us something about the relative amount of debt the firm uses but nothing about the ability of the firm to pay the interest or principal on the debt. In addition, earlier in this chapter we identified the times interest earned ratio as a useful measure of a firm's ability to pay the interest it owes on its debt financing:

$$\text{Times Interest Earned} = \frac{\text{Operating Income or EBIT}}{\text{Interest Expense}} \quad \textbf{(15–3)}$$

For example, in its 2016 income statement Walmart reported EBIT of $24.105 billion and had interest expense totaling $2.467 billion. Substituting into Equation (15–3) produces a times interest earned ratio of 9.77 times for the year:

$$\text{Times Interest Earned} = \frac{\text{Operating Income or EBIT}}{\text{Interest Expense}} = \frac{\$24.105 \text{ billion}}{\$2.467 \text{ billion}} = 9.77 \text{ times}$$

This ratio indicates that Walmart can very comfortably afford to pay the interest on its debt (financial leverage), as operating earnings could be reduced to 1/10 of their 2016 level before the firm would have trouble paying its interest expense.

The EBITDA coverage ratio is another ratio that refines the times interest earned ratio to incorporate consideration for depreciation and amortization (which are noncash expenses that are deducted from revenues when calculating EBIT) and also includes consideration for the principal payments that are due during the period as well as interest expenses. Specifically, the EBITDA coverage ratio is calculated as follows:

$$\text{EBITDA Coverage Ratio} = \frac{\text{Earnings Before Interest and Taxes} + \text{Depreciation Expense} + \text{Amortization Expense}}{\text{Interest Expense} + \text{Principal Payments}} = \frac{\text{EBITDA}}{\text{Interest Expense} + \text{Principal Payments}} \quad \textbf{(15–12)}$$

In 2016 Walmart's repaid (net of new issues) $3,158 billion, its depreciation expense equaled $9.454 billion, and it had no amortization expenses. The resulting EBITDA coverage ratio for Walmart is calculated as follows:

$$\text{EBITDA Coverage Ratio} = \frac{\$24.105 \text{ billion} + \$9.454 \text{ billion}}{\$2.457 \text{ billion} + \$3.158 \text{ billion}} = 5.97 \text{ times}$$

This ratio more realistically captures Walmart's ability to service its debt and suggests that EBITDA could drop by over 80 percent of the 2016 level before the firm is in jeopardy of not being able to pay its interest plus principal out of its 2016 EBITDA of $33.459 billion = $24.105 billion + $9.454 billion .

We now have the financial decision tools to evaluate the firm's capital structure. The latest addition to our decision tools is the EBDITA coverage ratio.

Tools of Financial Analysis—EBITDA Coverage Ratio

Name of Tool	Formula	What It Tells You
EBITDA coverage ratio	$\frac{EBIT + \text{Depreciation Expense} + \text{Amortization Expense}}{\text{Interest Expense} + \text{Principal Payments}}$	• An alternative coverage ratio that tells you how many times the firm could pay interest and principal from the cash flow from operations. • A higher ratio indicates a lower probability of default.

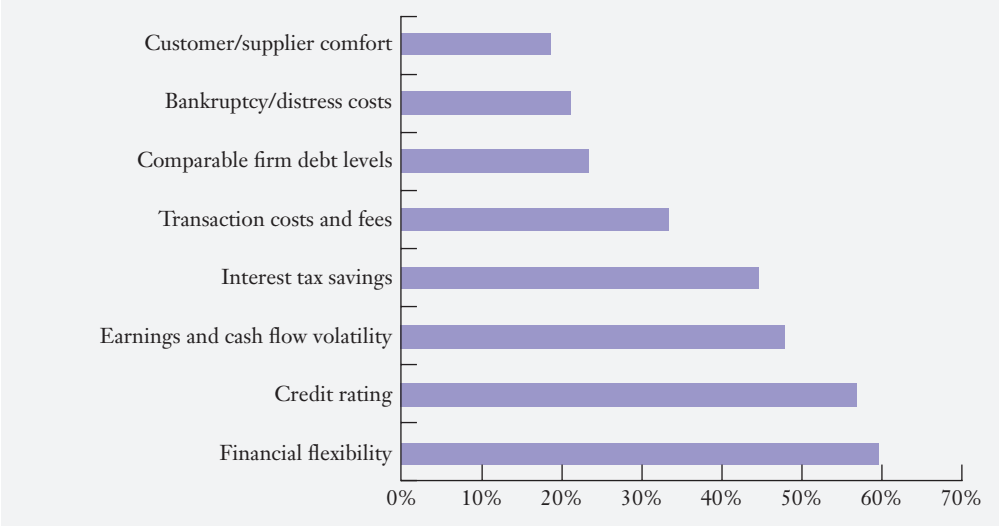
Survey Evidence: Factors That Influence CFO Debt Policy

John Graham and Campbell Harvey surveyed 392 CFOs about the importance of potential determinants of their capital structure choices. The CFOs were asked to rate 14 factors using a scale from 0 to 4, with a 0 indicating not important and 4 representing very important. The percentages of respondents that rated a particular factor as either important (3) or very important (4) are reported in Figure 15.8.

Figure 15.8

CFO Opinions Regarding Factors That Influence Corporate Debt Use

The CFOs of 392 firms were asked to rank a list of 14 factors in the order of importance to their firms in making the decision to use debt financing. The percentages of respondents that rated the individual factors as either important or very important are listed below for the eight highest-rated factors.



Source: John Graham and Campbell Harvey, "How Do CFOs Make Capital Budgeting and Capital Structure Decisions?," *Journal of Applied Corporate Finance* 15, no. 1 (Spring 2002): 14.

>> END FIGURE 15.8

Finance in a **Flat World**

Capital Structures Around the World

Many factors influence the use of debt financing, and one of these factors is the home country of the firm. Consider the following listing of median leverage ratios (the firm's total debt divided by its market value*) by country:

Country	Leverage Ratio
South Korea	70%
Pakistan	49%
Brazil	47%
Thailand	46%
India	40%
Japan	33%
China	33%
France	28%
Belgium	26%
Mexico	26%
Chile	21%
Germany	17%
United Kingdom	16%
United States	16%
Greece	10%

The highest leverage ratio, observed in South Korea, is close to 70 percent, whereas the lowest is only 10 percent, observed in Greece. The median leverage ratio in the United States is only 16 percent, which may seem quite low. However, this is the result of the fact that these ratios are based on the market values of the firms rather than their book values.

What kind of factors might encourage the use of debt in different countries? Researchers found that firms operating in countries where the legal system provides better protection for financial claimants tend to use less total debt and that the debt they use tends to be of a longer-term maturity. In addition, as you might expect, the tax policy of the country in which the firm operates also plays a role in the level of debt that a firm uses.

*The market value of the firm is defined as the market value of its common equity plus the book values of its preferred stock and total debt.

Source: Joseph P. H. Fan, Sheridan Titman, and Garry J. Twite, "An International Comparison of Capital Structure and Debt Maturity Choices," October 4, 2011, available at http://ssrn.com/abstract=423483.

Financial flexibility received the highest rating, with over 59 percent of the respondents rating this factor as either an important or a very important factor influencing their decision to use debt financing. Clearly, maintaining the ability to issue either debt or equity by not pushing the firm's capital structure to the limits of the firm's debt capacity is an important consideration to these practicing CFOs. The next factor, in order of importance to the CFOs, is the firm's credit rating. Pushing the use of debt financing past the point where it triggers a credit rating downgrade is a signal that bankruptcy and financial distress are more likely, and this, in turn, makes the firm a less attractive business partner. Indeed, concerns about bankruptcy and the firm's relationship with its customers and suppliers are also listed as factors that influence the capital structure choice. Finally, slightly less than 50 percent of the CFOs listed the tax benefits of debt financing as an important influence on their capital structure choice. In sum, the CFOs' opinions support the theory of capital structure policy.

Lease Versus Buy

Up to this point, we have implicitly assumed that firms will be buying their capital equipment. In reality, firms often lease their equipment. Indeed, roughly 4 out of 10 planes in the world's commercial airplane fleet are leased, and this number is growing. By leasing, the firm makes rental payments for the use of the equipment but does not own or acquire the title to it.

Before initiating our discussion of the lease-versus-buy choice, we should point out that entering into a very long-term lease—for example, a 25-year-lease on an airplane—is very similar to buying the asset and financing it with long-term debt. In both cases, the firm has a long-term obligation, and the liability is treated as debt on its balance sheet. We can thus think of leasing as an alternative financing vehicle, and under the perfect market assumptions of the M&M capital structure theorem, the lease-versus-buy choice is a matter of indifference. Hence, our discussion of the lease-versus-buy choice will focus on the imperfections that make leasing more or less favorable.

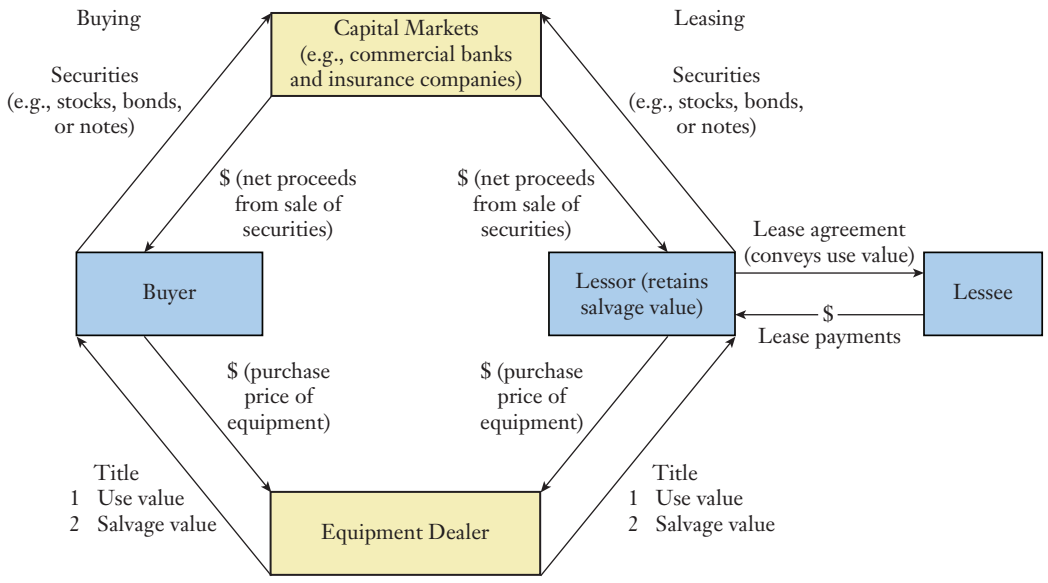
We also should make it clear that the type of lease we will consider here is a **capital lease**, which is a long-term agreement to lease equipment over its useful life. With this type of lease contract, the lessor acquires and finances the leased equipment and all other rights of ownership transfer to the lessee (the company that uses the leased equipment). This contrasts with an **operating lease**, which is a short-term rental, like renting a car on a business trip. Technically, an operating lease is a contract whereby the lessor permits the user or lessee to use of an asset for a particular period which is shorter than the economic life of the asset without any transfer of ownership rights.

How Does Buying Differ from Leasing?

Figure 15.9 provides a visual comparison of buying versus leasing. The left-hand side of the figure captures the entities involved in a buying decision. The buyer raises funds from the capital markets (through a bank loan for smaller outlays or the sale of notes or bonds for larger outlays) and then acquires the equipment. Note that ownership of the equipment gives the buyer both the use of the equipment and its salvage value when the buyer decides to get rid of it.

Figure 15.9

Buying Versus Leasing



>> END FIGURE 15.9

The right-hand side of Figure 15.9 depicts the leasing choice. The firm that acquires use of the equipment is now denoted as the lessee, and the entity leasing the equipment is the lessor. The lessor or leasing company raises the funds needed to acquire the equipment, buys the equipment, and enters into a long-term capital lease with the lessee company. The lessor may be an independent leasing company, the equipment dealer, or the financial institution that provides the financing for the purchase of the leased equipment. The key thing to note about the leasing arrangement is that the use of the equipment is transferred to the lessee while the title to the equipment is not.

Why Would a Firm Choose Leasing Versus Buying?

Equipment leasing companies traditionally offer a litany of advantages of leasing over buying. To identify the factors that have a sound economic basis, we will first identify the potential cost differences to firms that buy versus lease their equipment.

Residual Value

The lessor retains ownership of the value of the leased equipment when it comes off the lease. For example, if you lease a car for three years, after the three-year period is up, you must return the car to the lessor. The value of the equipment after the lease term, the **residual value**, cannot be known at the time the lease agreement is negotiated, so there is room for disagreement between the lessor and lessee that might favor leasing or buying. For example, if you lease an automobile, you receive the use of the automobile over the lease term in return for a set of lease payments (which might include a down payment), and the lessor receives the lease payments plus the estimated value of the automobile at the end of the lease term. If the lessor builds in an estimated residual value of $30,000 and your best guess is that it will be worth $25,000, you may find the lease agreement an attractive alternative to buying the car. Very simply, the leasing company has built in a higher residual value for the automobile than you think is appropriate.

Tax Consequences

When a firm buys a piece of equipment, there are tax consequences. First, the cost of the equipment is depreciated over its useful life, which reduces the firm's income tax liability. In addition, the interest payments on the debt used to finance the purchase are tax-deductible. Finally, there can be investment tax credits associated with buying new equipment that directly reduce the firm's taxes by the amount of the credits.

When the firm leases a piece of equipment, the lessor gets the tax benefits of ownership described above, and the lessee gets to expense the rental payments. So are net tax savings greater for buying or leasing? To answer this question, one should first note that the party with the higher tax rate will get greater tax benefits from owning the equipment. For example, suppose the lessee firm is not currently paying income taxes and does not expect to pay taxes over the term of the lease agreement (perhaps due to operating loss carryforwards). In this instance, the tax benefits of ownership are not directly available to the lessee firm. However, if the lessor firm enjoys the tax benefits, those tax benefits are at least partially passed on to the lessee through more favorable lease terms, and in this way part of the tax benefits are captured by the lessor firm. In this case, taxes favor leasing. Taxes can also favor leasing if the lessor is a financial institution that is able to take advantage of more tax favored debt financing than the lessee could do if they owned the property directly.

Operating and Maintenance Expenses

Complex pieces of equipment involved in lease agreements such as airplanes often require substantial maintenance and upkeep while they are being used. Whether the lessor or lessee is responsible for these costs depends on the type of lease agreement they use. A **net lease** is one in which the lessee is responsible for the paying a portion of all the taxes, fees, and maintenance costs for the leased property or equipment in addition to paying rent.

The choice of the type of lease agreement is an important one and should reflect the relative economics of performing the required maintenance for the two parties. For example, if the lessor is a finance company with no expertise for providing the required maintenance, then the lease contract will almost certainly be a net lease. Furthermore, to protect the lessor from the prospect that the lessee might provide subpar maintenance that could decrease the residual value of the equipment, the lessor might use a net-net lease agreement.

Finance for Life

Leasing or Buying Your Next Car

Barry has just graduated from college and landed his first job, and he needs a car. Barry thinks he can afford to pay about $500 a month for the car. The Honda dealer will sell him a CR-V for $24,501.22 and is willing to arrange for a car loan with no down payment, since Barry is a new college graduate. The dealer has also offered to lease the CR-V to him for $333.45 a month for five years. The salesman went on to say that with the lease agreement Barry will be allowed to drive up to 15,000 miles per year and at the end of the five year lease term he will need to turn in the car to the dealership with no damage beyond the normal wear for the five-year period. If Barry buys the car, his payments will be $496.77 a month (which corresponds to an 8 percent annual rate of interest), but after five years, the loan will be paid off, and he will own the CR-V, which he estimates will be worth about $12,000.

What should Barry do?

Analysis of the Automobile Lease-or-Buy Decision

Here's what we know about Barry's lease-or-buy problem:

Purchase price	$24,500.00
Borrowing rate	8%
Dealer's estimated residual value	$12,000.00
Barry's estimated residual value	$12,000.00
Lease and loan term (in years)	5
Purchase payments	$496.77
Lease payments	$333.45

At least initially, leasing is cheaper for Barry. However, after making 60 monthly lease payments of $333.45, Barry will have to turn in the CR-V. If he buys the car, after 60 months he will have a five-year-old CR-V that he thinks will be worth $12,000. So which alternative should he choose?

We can look at the problem as either the future or the present value of Barry's costs with leasing or buying. Let's consider the future value costs for now. The future value of the out-of-pocket loan payments is ($36,501.22). When we net out the residual value of his CR-V, estimated to be $12,000, that leaves a future value net cost of buying of ($24,501.22). Now let's compute the future value of the stream of lease payments using the same 8 percent rate. The future value is ($24,501.22). In this particular case, Barry is neither better nor worse off with leasing or buying the CR-V.

Was it a coincidence that the two numbers are identical? Actually, no. To come up with the lease payments we assumed that the lessor's cost of capital (the lease rate) is 8 percent, assumed the same $12,000 resale value at the end of the lease, ignored any tax advantage that might tilt the balance toward leasing or buying, and assumed that the lessor will exactly break even on the transaction.

In reality, the costs will differ. An important driver of the advantage to leasing versus buying is the estimated residual value. For example, what if Barry thinks the residual value estimate is too high and estimates the CR-V will be worth only $8,000? In this case, the future value of the purchase option rises to ($28,502.22) (i.e., by the $4,000 difference in estimated residual value) compared to the ($24,501.22) based on the lease. Another factor that drives the cost of leasing versus buying is the rate of interest embedded in the loan to buy versus the lease rate used in the calculation of the lease payments. For example, let's assume that Barry can arrange his own loan at a rate of only 6 percent, whereas the lease payments include an embedded cost of 8 percent. This change makes the future value cost of buying the car only ($21,046.83) compared to the future value cost of leasing of ($24,501.22).

The key things to remember from this analysis are the following:

- With no taxes and transaction costs, the costs of leasing and buying are the same if the lessor breaks even on the transaction.
- The lease-versus-buy choice hinges on a comparison of the total costs of the alternatives.
- Cost differences in leasing versus buying arise out of differences in the embedded cost of money (the interest rates) and the estimated residual value for the leased asset.

http://www.bankrate.com/calculators/auto/buy-or-lease-calculator.aspx.

Your Turn: See Study Question 15–24.

Before you begin end-of-chapter material

Concept Check | 15.4

1. In what ways does the firm's capital structure affect its earnings per share?
2. What is the EBIT-EPS indifference point, and how is this concept useful in analyzing a capital structure decision?
3. How are various leverage ratios and industry norms used in capital structure management?

Applying the Principles of Finance to Chapter 15

P Principle 2: **There Is a Risk-Return Tradeoff** Managers sometimes take on more debt in their capital structures in an attempt to increase the rate of return stockholders receive. However, as we know from Principle 2, the increased return is offset by an increase in risk, which results in an increased required rate of return.

P Principle 3: **Cash Flows Are the Source of Value** The relevance of capital structure is determined by whether capital structure choice affects the cash flows that can be distributed to the debt and equity holders.

P Principle 5: **Individuals Respond to Incentives** Added debt and the subsequent need to cover interest payments limit managers' discretionary spending and thereby add discipline to spending decisions that helps avoid agency problems.

Chapter Summaries

15.1 Describe a firm's capital structure. (pgs. 516–520)

SUMMARY: A firm's financial structure is the mix of all items that appear on the right-hand side of its balance sheet. This includes all of the firm's current liabilities as well as long-term debt and owners' equity. For purposes of analyzing a firm's financing decisions, we typically limit our consideration to the firm's capital structure, which includes interest-bearing liabilities, such as short- and long-term debt, and equity (preferred and common). Although it is common practice to evaluate a firm's capital structure using book values, as we learned in Chapter 14, we should use market values when analyzing a firm's capital structure as part of a cost of capital estimation.

KEY TERMS

Enterprise value, page 517 The sum of the firm's market capitalization plus net debt.

Favorable financial leverage, page 519 When the firm's investments earn a rate of return (before taxes) that is greater than the cost of borrowing, this results in higher EPS and a higher rate of return on the firm's common equity.

Financial structure, page 516 The mix of sources of financing used by the firm to finance its assets. Commonly described using the ratios found by dividing each source of financing on the right-hand side of the firm's balance sheet by the sum of the firm's total liabilities plus owners' equity.

Net debt, page 517 The book value of interest-bearing debt less excess cash.

Optimal capital structure, page 516 The mix of financing sources in the capital structure that maximizes shareholder value.

Unfavorable financial leverage, page 519 When the firm's investments earn a rate of return (before taxes) that is less than the cost of borrowing, this results in lower EPS and a lower rate of return on the firm's common equity.

KEY EQUATIONS

$$\text{Debt Ratio} = \frac{\text{Total Liabilities}}{\text{Total Assets}} \quad \textbf{(15–1)}$$

$$\text{Enterprise Value} = \left(\text{Book Value of Interest-Bearing Debt} - \text{Excess Cash}\right) + \text{Market Value of Equity} \quad \textbf{(15–2)}$$

$$\text{Enterprise Value} = \text{Net Debt} + \text{Market Value of Equity} \quad \textbf{(15–2a)}$$

$$\text{Debt to Enterprise Value} = \frac{\text{Book Value of Interest-Bearing Debt} - \text{Excess Cash}}{\left(\text{Book Value of Interest-Bearing Debt} - \text{Excess Cash}\right) + \text{Market Value of Equity}} = \frac{\text{Net Debt}}{\text{Enterprise Value}} \quad \textbf{(15–3)}$$

$$\text{Times Interest Earned} = \frac{\text{Net Operating Income or EBIT}}{\text{Interest Expense}} \quad \textbf{(15–4)}$$

Concept Check | 15.1

1. How does the debt ratio differ from the debt-to-enterprise-value ratio?
2. What does the times interest earned ratio measure?
3. What is financial leverage?
4. What determines whether financial leverage is favorable or unfavorable?

15.2 Explain why firms have different capital structures and how capital structure influences a firm's weighted average cost of capital.

(pgs. 520–531)

SUMMARY: Under the Modigliani and Miller (M&M) assumptions, the financing mix or capital structure of the firm does not have any effect on the value of the firm. However, when we relax the M&M assumptions, we learn that capital structure can be an important factor in determining the value of the firm. In particular, there are three primary reasons that capital structure can be important. First, because interest payments on the firm's debt are tax-deductible but dividend payments on the firm's equity are not, debt financing is favored by the U.S. tax code. Second, interest on debt is a fixed obligation, and firms that default on this obligation can be forced into bankruptcy, which can create numerous costs for the firm. The third factor is that the threat of bankruptcy and, more generally, of financial distress can influence the behavior of a firm's executives, employees, and customers. In particular, the threat of bankruptcy can make the firm a less attractive supplier and employer, but at the same time, it can focus the attention of the firm's executives on decisions that contribute to the firm's value and thereby keep it out of financial trouble.

KEY TERMS

Agency costs, page 529 The costs incurred by a firm's common stockholders when the firm's management makes decisions that are not in the shareholders' best interests but instead further the interests of the management of the firm.

Financial distress costs, page 527 The costs incurred by a firm that cannot pay its bills (including principal and interest on debt) in a timely manner.

Interest tax savings, page 525 The reduction in income tax resulting from the tax deductibility of interest expense.

Internal sources of financing, page 530 The retained earnings of a firm that can be reinvested in the firm.

KEY EQUATIONS

$$\text{Firm Value}(V) = \frac{\text{Firm Cash Flow}}{\text{Weighted Average Cost of Capital } (k_{WACC})} \quad \textbf{(15–5)}$$

$$k_{WACC} = \left[\begin{array}{c}\text{Cost of}\\ \text{Debt } (k_d)\end{array} \times \begin{array}{c}\text{Debt to}\\ \text{Value } (D/V)\end{array}\right] + \left[\begin{array}{c}\text{Cost of}\\ \text{Equity } (k_e)\end{array} \times \begin{array}{c}\text{Equity to}\\ \text{Value } (E/V)\end{array}\right] \quad \textbf{(15–6)}$$

$$\begin{array}{c}\text{Cost of}\\ \text{Equity } (k_e)\end{array} = k_{\text{Unlevered}} + (k_{\text{Unlevered}} - k_d)\left(\frac{D}{E}\right) \quad \textbf{(15–7)}$$

$$\left[\begin{array}{c}\text{Cash Flows to}\\ \text{a Firm with}\\ \text{Financial Leverage}\end{array}\right] = \left[\begin{array}{c}\text{Cash Flows to}\\ \text{the Firm Without}\\ \text{Leverage}\end{array}\right] + \left[\begin{array}{c}\text{Interest}\\ \text{Tax}\\ \text{Savings}\end{array}\right] \quad \textbf{(15–8)}$$

$$\begin{array}{c}\text{Cost of}\\ \text{Equity } (k_e)\end{array} = k_{\text{Unlevered equity}} + \left[(k_{\text{Unlevered equity}} - k_d)\left(\frac{D}{E}\right) \times (1 - \text{Tax Rate})\right] \quad \textbf{(15–9)}$$

$$k_{WACC} = \left[\begin{array}{c}\text{Cost of}\\ \text{Debt } (k_d)\end{array}\left(1 - \begin{array}{c}\text{Tax}\\ \text{Rate}\end{array}\right) \times \begin{array}{c}\text{Debt to}\\ \text{Value } (D/V)\end{array}\right] + \left[\begin{array}{c}\text{Cost of}\\ \text{Equity } (k_e)\end{array} \times \begin{array}{c}\text{Equity to}\\ \text{Value } (E/V)\end{array}\right] \quad \textbf{(15–10)}$$

Concept Check | 15.2

1. Who were the financial economists that in 1958 challenged the importance of capital structure management? What is the essence of their theory of capital structure?
2. Discuss the role of the following factors in the firm's capital structure decision: taxes, bankruptcy costs, managerial incentives, and how well informed managers are compared to stockholders.

15.3 Describe some fundamental differences in industries that drive differences in the way they finance their investments. (pgs. 531–532)

SUMMARY: Firms that operate in different industries often have very different capital structures. For example, software companies tend to borrow very little, whereas public utilities rely heavily on debt financing. Differences in the capital structure choices of firms in different industries can be traced back to differences in the economic circumstances of the firms in the different industries. The costs and benefits of using debt versus equity vary, depending on the inherent business risk of the industry. This difference then affects the likelihood that the firm will experience financial distress and, consequently, the firm's willingness to borrow money to finance its investments because borrowing increases the risk of default.

Concept Check | 15.3

1. What are some reasons for firms in different industries to have different capital structures?

15.4 Use the basic tools of financial analysis to analyze a firm's financing decisions. (pgs. 532–545)

SUMMARY: The practical analysis of capital structure decisions typically proceeds in two phases. Phase one consists of benchmarking the firm's capital structure against that of one or more competitor firms that are thought to share the same level of overall business risk. In this analysis, the firm can assess how the proposed capital structure alternatives will change the capital structure of the firm and provide the basis for comparing this change to similar firms. This will usually involve looking at both capital structure ratios, the debt ratio and interest-bearing debt ratio, as well as analyzing the expected impact of the alternatives on the level and volatility of the firm's reported earnings per share.

The second phase of the analysis proceeds to a direct assessment of the probability of default to determine whether the firm can afford more or less debt financing than the comparison firms used in the benchmarking exercise. As we described earlier, debt financing brings with it the tax savings from interest expense. However, using excessive amounts of debt will expose the firm to an unacceptable level of risk of financial distress and bankruptcy.

KEY TERMS

Benchmarking, page 532 Comparing the firm's current and proposed capital structures to those of a set of firms that are considered to be in similar lines of business and, consequently, subject to the same types of risk.

Capital lease, page 543 A long-term agreement to lease equipment over its useful life. With this type of lease contract the lessor acquires and finances the leased equipment and all other rights of ownership transfer to the lessee (the company that uses the leased equipment). These are sometimes referred to as finance or financial leases.

EBITDA coverage ratio, page 533 The ratio of the sum of EBIT plus depreciation expense (EBITDA) divided by interest plus annual before-tax principal payments (principal divided by 1 minus the firm's tax rate).

EBIT-EPS chart, page 538 A graphic representation of the relationship between EPS and the level of firm EBIT.

EBIT-EPS indifference point, page 540 The level of EBIT that produces the same level of EPS for two different capital structures.

Financial leverage effect, page 533 The effect of using debt financing in a firm's capital structure; firm EPS increases when leverage is favorable and decreases when leverage is unfavorable.

Interest-bearing debt ratio, page 532 The ratio of interest-bearing debt (short- and long-term) to total assets.

Net lease, page 544 A lease agreement in which the lessee is responsible for paying a portion of all the taxes, fees and maintenance costs for the leased property or equipment in addition to paying rent. This type of agreement is commonly used with commercial real estate.

Operating lease, page 543 A contract whereby the lessor permits the user or lessee to use an asset for a period of time which is shorter than the economic life of the asset without any transfer of ownership rights.

Range of earnings chart, page 538 Same as EBIT-EPS chart.

Residual value, page 544 The value of the leased asset at the end of the lease term.

KEY EQUATIONS

$$\underbrace{\frac{(EBIT - \text{Interest Expense}_{\text{Stock plan}})(1 - \text{Tax Rate})}{\text{Shares Outstanding (Stock Plan)}}}_{\text{EPS for the Stock Plan}} = \underbrace{\frac{(EBIT - \text{Interest Expense}_{\text{Bond plan}})(1 - \text{Tax Rate})}{\text{Shares Outstanding (Bond Plan)}}}_{\text{EPS for the Bond Plan}} \quad \textbf{(15–11)}$$

$$\text{EBITDA Coverage Ratio} = \frac{\text{Earnings Before Interest and Taxes} + \text{Depreciation Expense} + \text{Amortization Expense}}{\text{Interest Expense} + \text{Principal Payments}} = \frac{\text{EBITDA}}{\text{Interest Expense} + \text{Principal Payments}} \quad \textbf{(15–12)}$$

Concept Check | 15.4

1. In what ways does the firm's capital structure affect its earnings per share?
2. What is the EBIT-EPS indifference point, and how is this concept useful in analyzing a capital structure decision?
3. How are various leverage ratios and industry norms used in capital structure management?

Study Questions

15–1. In *Regardless of Your Major: Capital Structure Matters to You!* on page 516, we learned about the dangers of using a high proportion of debt financing faced by both General Motors (GM) and Lehman Brothers. How could the failure of these firms possibly matter to you personally or to your parents?

15–2. How does a firm's *financial structure* differ from its *capital structure*?

15–3. What are non-interest-bearing liabilities? Give some examples. Why are non-interest-bearing liabilities not included in the firm's capital structure?

15–4. What is financial leverage? What is meant by the use of the terms *favorable* and *unfavorable* with regard to financial leverage?

15–5. What is the financial argument for greater stakeholder awareness in the boardroom in a more highly leveraged organization?

15–6. What are the two fundamental assumptions that are used to support the M&M capital structure theory? Describe each in commonsense terms.

15–7. What does Figure 15.2 have to say about the impact of a firm's financing decisions on firm cash flows?

15–8. Under the conditions of the M&M capital structure theory, the firm's financing decisions do not have an impact on firm value. When this theory holds (i.e., is true), how do the firm's financing decisions affect the firm's weighted average cost of capital? Describe how the cost of equity and cost of debt behave as the firm increases its use of debt financing.

15–9. Describe why capital structure is relevant to the value of the firm. Discuss the potential violations of both of the basic assumptions that support the M&M capital structure theory.

15–10. Why do some managers believe that debt is a more tax-efficient manner of funding a business? What are the two presumptive requirements for this to be true?

15–11. Does the debt: equity structure affect the EPS? How does this relate to the M&M concept of irrelevancy?

15–12. How does the presence of financial distress costs, combined with the tax deductibility of interest (and the resulting interest tax savings), affect a firm's weighted average cost of capital as the firm increases its use of debt financing from no debt to higher and higher levels of debt?

15–13. What is a capital finance lease agreement?

15–14. What does the term *benchmarking* mean with respect to making financing decisions?

15–15. Describe how each of the four financial ratios found in Table 15.3 is used to help managers make financing decisions.

15–16. What is EBIT-EPS analysis, and how is it used in making financing decisions?

15–17. The Ballard Corporation is considering adding more debt to its capital structure and has asked you to provide it with some guidance. After looking at future levels of Ballard's EBIT, you feel very confident that in the future it will consistently be above the EBIT-EPS indifference point calculated using Ballard's current capital structure and its proposed capital structure. Based on this analysis, do you think you would be more inclined to recommend that the company keep its current capital structure or go with the proposed capital structure that will add more debt? Discuss the reasons underlying your recommendation.

15–18. Is sector benchmarking an important driver in the funding structure decision?

15–19. How would shareholders benefit from a rapid growth in profitability in a highly geared (leveraged) company? What is the main future risk?

15–20. What is financial flexibility, and why is it an important consideration when evaluating a financing decision?

15–21. A firm is considering replacing its current production facility with a new robotics production facility. As a result of this move, the firm's fixed costs will increase dramatically. To finance this new project, the firm is considering either issuing common stock or issuing debt. Should the firm consider these two decisions (whether to build the robotics facility and how to finance it) separately? How might the investment decision impact the financing decision?

15–22. In *Finance in a Flat World: Capital Structures Around the World* on page 542, we learned that capital structures differ dramatically in different countries around the world. What are some possible causes for the observed differences?

15–23. Use Figure 15-9 to describe potential differences between leasing a piece of equipment with a capital lease and purchasing the equipment using a bank loan.

15–24. The tax implications of leasing versus buying a piece of equipment can sometimes favor leasing and at other times favor buying. Explain.

Study Problems

MyLab Finance
Go to www.myfinancelab.com to complete these exercises online and get instant feedback.

Capital Structure Policies

15–1. **(Calculating debt ratio)** **(Related to Checkpoint 15.1 on page 534)**

Sharpgas plc	£m		£m
Current assets	6	Current liabilities	8
Non-current assets	30	Long-term debt	20
		Shares	2
		Reserves	6
	36		**36**

You have just taken over a portfolio of bank clients including Sharpgas Plc. Their latest balance sheet is as above. What questions would you ask immediately with regard to their capital structure?

15–2. **(Calculating capital structure weights)** The following figures were extracted from the latest annual report of Critsim Plc.

Critsim plc	000's		000's
Current assets	615	Current liabilities	415
Non-current assets	5,240	Long-term debt	3,500
		Shares	1,430
		Reserves	510
	5,855		**5,855**
Revenue	1,210		
Direct	1,015		
Op profit	**195**		
Interest @ 5%	175		
Tax @ 20%	4		
Distributable	**16**		

The directors of Critsim Plc have the opportunity to acquire a competitor company for £2 million, which would need to be funded by debt; the bank has agreed to finance this on the same basis as the existing debt. What level of profitability will be required from the acquisition to maintain a similar relationship between operating profit and distributable profit?

15–3. **(Calculating capital structure weights)** **(Related to Checkpoint 15.1 on page 534)** Returning to Study Problem 15–2, describe the capital structure both before and after the acquisition. Suggest three concerns that the shareholders ought to raise at the next AGM.

15–4. **(Adjusting a firm's capital structure)** Curley's Fried Chicken Kitchen operates two southern-cooking restaurants in St. Louis, Missouri, and has the following financial structure:

Accounts payable	$ 100,000
Short-term debt	400,000
Current liabilities	$ 500,000
Long-term debt	$2,000,000
Owners' equity	1,500,000
Total	$4,000,000

The firm is considering an expansion that would involve raising an additional $2 million.

a. What are the firm's debt ratio and interest-bearing debt ratio for its present capital structure?

b. If the firm wants to have a debt ratio of 50 percent, how much equity does the firm need to raise in order to finance the expansion?

15–5. **(Describing a firm's capital structure)** **(Related to Checkpoint 15.1 on page 534)** Home Depot, Inc. (HD), operates as a home improvement retailer primarily in the United

States, Canada, and Mexico. The balance sheet for Home Depot for February 3, 2008, included the following liabilities and owners' equity:

($ thousands)	Financial Structure
Liabilities	
Accounts payable	$ 9,185,000
Short-term/current debt	2,047,000
Other current liabilities	1,474,000
Total current liabilities	**$12,706,000**
Long-term debt	11,383,000
Other long-term liabilities	2,521,000
Long-term liabilities	**$13,904,000**
Stockholders' equity	**$17,714,000**
Total	**$44,324,000**

a. What are Home Depot's debt ratio and interest-bearing debt ratio?
b. If Home Depot has common equity with a market value of $44.9 billion and no excess cash, what is the firm's debt-to-enterprise-value ratio? (Hint: Assume that the market value of the firm's interest-bearing debt equals its book value.)

15–6. **(Describing a firm's capital structure)** Lowe's Companies, Inc. (LOW), and its subsidiaries operate as a home improvement retailer in the United States and Canada. As of February 1, 2008, they operated 1,534 stores in 50 states and Canada. The company's balance sheet for February 1, 2008, included the following sources of financing:

($ thousands)	Financial Structure
Liabilities	
Accounts payable	$ 4,137,000
Short-term/current debt	1,104,000
Other current liabilities	2,510,000
Total current liabilities	**$ 7,751,000**
Long-term debt	5,576,000
Other long-term liabilities	670,000
Long-term liabilities	**$ 6,246,000**
Stockholders' equity	**$16,098,000**
Total	**$30,095,000**

a. Calculate the values of Lowe's debt ratio and interest-bearing debt ratio.
b. If Lowe's has common equity with a market value of $35.86 billion and no excess cash, what is the firm's debt-to-enterprise-value ratio? (Hint: Assume that the market value of the firm's interest-bearing debt equals its book value.)
c. (Optional) Compare your analysis of Lowe's capital structure to that of Home Depot (HD) in Study Problem 15–5. Can you determine which of the two firms is more highly levered (i.e., uses the most financial leverage)? If so, what is your assessment of the two firms' capital structures?
d. (Optional) What is the credit rating for Lowe's, and how does it compare to that of Home Depot? (Hint: Look up bond credit ratings online.)

Capital Structure Theory

15–7. **(Computing interest tax savings)** Returning to Study Problem 15–1, you have now found out in an investors briefing session that Sharpgas Plc have suffered a reduction in profitability in the current year to the extent that their financial accounts will reflect an operating loss before interest and tax. They assure you that this is a short-term problem. Revenue for 2016 was £30 million (2015 £32 million) and costs in 2016 look to have increased by £2 million from £28 million in 2015. Interest on the historic long-term debt is payable at 10 percent, and the dividend policy reflects a 2 percent increase each year for the last 10 years, with the quantum payment for 2015 being £1.2 million. The first tranche (£4 million) of debt repayment is due in six months' time. Identify the problems and suggest options for maintaining shareholder confidence.

15–8. **(Computing interest tax savings)** Presently, H. Swank, Inc., does not use any financial leverage and has total financing equal to $1 million. It is considering refinancing and issuing $500,000 of debt that pays 5 percent interest and using that money to buy back half the firm's common stock. Assume that the debt has a 30-year maturity and that Swank will have no principal payments for 30 years. Swank currently pays all of its net income to common shareholders in the form of cash dividends and intends to continue to do this in the future. The corporate tax rate on the firm's earnings is 35 percent. Swank's current income statement (before the debt issue) is as follows:

Net operating income (EBIT)	$100,000
Interest expense	0
Earnings before taxes	$100,000
Income taxes	(35,000)
Net income	$ 65,000

a. If Swank issues the debt and uses it to buy back common stock, how much money can the firm distribute to its stockholders and bondholders next year if the firm's EBIT remains equal to $100,000?
b. What are Swank's interest tax savings from the issuance of the debt?
c. Are Swank's stockholders better off after the debt issue? Why or why not?

Making Financing Decisions

15–9. **(Analyzing coverage ratios)** **(Related to Checkpoint 15.1 on page 502)** The income statements for Home Depot, Inc. (HD), spanning the period 2014–2016 (just before the housing crash, so these are representative years) are as follows:

$ thousands	2016	2015	2014
Net operating income (EBIT)	$11,774,000	$10,469,000	$9,166,000
Interest expense	(919,000)	(830,000)	(711,000)
Earnings before taxes	$11,021,000	$ 9,976,000	$8,467,000
Income taxes	(4,012,000)	(3,631,000)	(3,082,000)
Net income	$7,009,000	$ 6,345,000	$5,385,000

a. Calculate the times interest earned ratio for each of the years for which you have data.
b. What is your assessment of how the firm's ability to service its debt obligations has changed over this period?

15–10. **(Analyzing coverage ratios)** The income statements for Lowe's Companies, Inc. (LOW), spanning the period 2014–2016 (just before the housing crash, so these are representative years) are as follows:

	2016	2015	2014
Net operating income (EBIT)	$4,971,000	$4,792,000	$4,149,000
Interest expense	(552,000)	(516,000)	(476,000)
Earnings before taxes	$4,420,000	$4,280,000	$3,670,000
Income taxes	(1,870,000)	(1,580,000)	(1,390,000)
Net income	$2,550,000	$2,700,000	$2,290,000

a. Calculate the times interest earned ratio for each of the years for which you have data.
b. What is your assessment of how the firm's ability to service its debt obligations has changed over this period?
c. (Optional) How does Lowe's compare to Home Depot (HD) in Study Problem 15–9? Is it better able to service its debt than Home Depot? Why or why not?

15–11. **(Calculating leverage and EPS)** You have developed the following pro forma income statement for your corporation. It represents the most recent year's operations, which ended yesterday.

Sales	$45,750,000
Variable costs	(22,800,000)
Revenue before fixed costs	$22,950,000
Fixed costs	(9,200,000)
Net operating income (EBIT)	$13,750,000
Interest expense	(1,350,000)
Earnings before taxes	$12,400,000
Income taxes (50%)	(6,200,000)
Net income	$ 6,200,000

Your supervisor in the controller's office has just handed you a memorandum asking for written responses to the following questions:

a. If sales increase by 25 percent, by what percentage will earnings before interest and taxes and net income increase?
b. If sales decrease by 25 percent, by what percentage will earnings before interest and taxes and net income decrease?
c. If the firm reduces its reliance on debt financing such that interest expense is cut in half, how does this affect your answers to parts a and b?

15–12. **(Using EBIT-EPS analysis)** **(Related to Checkpoint 15.2 on page 538)** Abe Forrester and three of his friends from college have interested a group of venture capitalists in backing their business idea. The proposed operation would consist of a series of retail outlets to distribute and service a full line of vacuum cleaners and accessories. These stores would be located in Dallas, Houston, and San Antonio. To finance the new venture, two plans have been proposed:

- Plan A is an all-common-equity structure in which $2 million would be raised by selling 80,000 shares of common stock.
- Plan B involves issuing $1 million in long-term bonds with an effective interest rate of 12 percent and raising another $1 million by selling 40,000 shares of common stock. The debt funds raised under Plan B have no fixed maturity date, in that this amount of financial leverage is considered a permanent part of the firm's capital structure.

Abe and his partners plan to use a 40 percent tax rate in their analysis, and they have hired you on a consulting basis to do the following:

a. Find the EBIT indifference level associated with the two financing plans.
b. Prepare a pro forma income statement for the EBIT level found in part a that shows EPS will be the same, regardless of whether Plan A or Plan B is chosen.

15–13. **(Using EBIT-EPS analysis)** Three recent graduates of the computer science program at the University of Tennessee are forming a company that will write and distribute new application software for the iPhone. Initially, the corporation will operate in the southern region of Tennessee, Georgia, North Carolina, and South Carolina. A small group of private investors in the Atlanta, Georgia, area is interested in financing the start-up company, and two financing plans have been put forth for consideration:

- Plan A is an all-common-equity capital structure in which $2 million would be raised by selling common stock at $20 per common share.
- Plan B involves the use of financial leverage, with $1 million raised by selling bonds with an effective interest rate of 11 percent (per annum) and the remaining $1 million raised by selling common stock at $20 per share. The use of financial leverage is considered to be a permanent part of the firm's capitalization, so no fixed maturity date is needed for the analysis. A 30 percent tax rate is deemed appropriate for the analysis.

a. Find the EBIT indifference level associated with the two financing plans.
b. A detailed financial analysis of the firm's prospects suggests that the long-term EBIT will be above $300,000 annually. Taking this into consideration, which plan will generate the higher EPS?

15–14. (Using EBIT-EPS break-even analysis) Return to Study Problems 15–1 and 15–7. You are now preparing your analysis of Sharpgas Plc. You have been asked to comment on the likely share price at the end of 2017. You know that there are 4 million shares in issue with a nominal value of £0.50 and that the Price Earnings Ratio is 10; this is still based on the 2015 income statement as the 2016 figures have not yet been released to the market. If the directors project an operating profit of £3 million for 2017 and estimate that the business will still suffer an interest charge of £2 million for 2017, assuming that other things are equal, and not allowing for any market or real-world systematic or unsystematic additional change (the theoretical world of M&M), what will be the likely percentage change in share price?

Mini-Case

Hewlett-Packard Co. Balance Sheet (October 31, 2007)

On September 27, 2007, Apple Inc. (AAPL) reported the following sources of financing in its balance sheet:

Apple Inc.
Balance Sheet, September 27, 2007

($ thousands)	Financial Structure
Liabilities	
Accounts payable	$ 6,230,000
Short-term/current debt	0
Other current liabilities	3,069,000
Total current liabilities	**$ 9,299,000**
Long-term debt	0
Other long-term liabilities	1,516,000
Long-term liabilities	**$ 1,516,000**
Stockholders' equity	**$14,532,000**
Total	**$25,347,000**

Moreover, the firm's 2007 income statement reported earnings of $3.496 billion with no interest expense:

Apple Inc.
Income Statements ($ thousands)

Period ending	29-Sep-07	30-Sep-06	24-Sep-05
Net operating income (EBIT)	5,008,000	2,818,000	1,815,000
Interest expense	0	0	0
Earnings before taxes	5,008,000	2,818,000	1,815,000
Income taxes	(1,512,000)	(829,000)	(480,000)
Net income	3,496,000	1,989,000	1,335,000

If Apple's management had been considering the possibility of using debt financing for the first time, it might have looked at Hewlett-Packard Company (HPQ) as a benchmark firm for comparison purposes. Hewlett-Packard used debt financing as shown on the following balance sheet and income statement:

Hewlett-Packard Company
Balance Sheet, October 31, 2007

($ thousands)	Financial Structure
Liabilities	
Accounts payable	$25,822,000
Short-term/current debt	3,186,000
Other current liabilities	10,252,000
Total current liabilities	**$39,260,000**
Long-term debt	4,997,000
Other long-term liabilities	5,916,000
Long-term liabilities	**$10,913,000**
Stockholders' equity	**$38,526,000**
Total	**$88,699,000**

Hewlett-Packard Company
Income Statements ($ thousands)

Period Ending	31-Oct-07	31-Oct-06	31-Oct-05
Net operating income (EBIT)	9,466,000	7,440,000	3,759,000
Interest expense	(289,000)	(249,000)	(216,000)
Earnings before taxes	9,177,000	7,191,000	3,543,000
Income taxes	(1,913,000)	(993,000)	(1,145,000)
Net income	7,264,000	6,198,000	2,398,000

a. Describe the capital structure of Hewlett-Packard using both the debt ratio and the interest-bearing debt ratio.

b. What is Hewlett-Packard's times interest earned ratio? If the company faces a principal payment equal to $3 billion, what is its EBITDA coverage ratio for 2007? (Hint: Hewlett-Packard's tax rate is 20 percent.)

c. Suppose Apple has decided to issue debt financing and use the proceeds to purchase some of its shares of stock from the open market. What fraction of the firm's 2.47 billion shares does the firm need to repurchase in order to make its interest-bearing debt ratio equal to that of Hewlett-Packard? If Apple had carried out the transaction by issuing bonds with an 8 percent rate of interest, what would its earnings per share have been in 2007?

d. Do you think that Apple's proposed change of capital structure makes good financial sense? Why or why not?

Appendix: Demonstrating the Modigliani and Miller Theorem

To illustrate conditions under which the Modigliani and Miller (M&M) theorem is true, assume there are two firms, Firm A and Firm B, that are identical in every respect except that they are financed differently. Firm A is financed completely by equity, whereas Firm B has borrowed a portion of its capital.

Because of the first assumption of the M&M theorem, we know that even though the two firms have different capital structures, they generate identical cash flows, which are uncertain and depend on the overall state of the economy. As we state in Panel A of Figure 15A.1, the total cash flows of the two firms in a recession equal $50 million, in normal times equal $100 million, and in booming times equal $150 million. To keep the example simple, we assume that these cash flows are generated in exactly one year and that after generating the cash flows, each firm distributes them to its debt and equity holders and then goes out of business. Moreover, we assume that Firm B's debt is risk-free, which means that the firm pays the risk-free interest rate of 5 percent on its debt.

We assume that Firm A, which is financed completely by equity, is valued at $75 million. Firm B, on the other hand, has a $42 million debt obligation it must repay at the end of one year. Thus, the present value of Firm B's Year 1 debt obligation of $42 million, when discounted at the 5 percent risk-free rate, is $40 million. If the M&M theorem holds, then Firm B must have the same $75 million value as Firm A, which uses no debt financing. Because Firm B's debt is valued at $40 million, the value of Firm B's equity must equal $35 million ($75 million minus $40 million) for both firms to be valued at $75 million.

But why does Firm B's equity need to have a value of $35 million? Asked somewhat differently, if the equity value was initially only $30 million, would market forces drive the value up to $35 million? Similarly, if the value of Firm B's equity was $45 million, would market forces drive the value back down to $35 million? The answer to both these questions is yes, as we illustrate in Figure 15A.1 and explain next.

Arbitrage and the Valuation of Levered and Unlevered Firms

To understand why the total values of Firm A and Firm B must be equal, let's assume that you have $7.5 million to invest and have the opportunity to acquire a 10 percent stake in the equity of either Firm A or Firm B. Which alternative would you prefer? If you invest in Firm A, it will cost you $7.5 million to purchase 10 percent of the firm's equity (which is 10 percent of its total value of $75 million). In the case found in Panel B, where the shares of Firm B are valued at $35 million, it will take $3.5 million to buy 10 percent of the Firm B's (which is 10 percent of the $35 million value of Firm B's equity), leaving you with remaining $4.0 million ($7.5 million less the $3.5 million invested in Firm B's equity) to invest in risk-free bonds earning the risk-free rate of 5 percent. Panel B of Figure 15A.1 shows the cash flows you will receive from these two investments. We see that if Firm B's equity is appropriately priced at $35 million, you will receive exactly the same cash flows from either investment strategy and are therefore indifferent between investing in either Firm A or Firm B.

Panel C of Figure 15A.1 provides the payoffs in the different states of the economy for the two investments described in the preceding paragraph for the case where Firm B's equity is *underpriced* at $30 million. As you can see, your investment in Firm B's equity and the risk-free bonds generates greater cash flows in each economic state. In other words, the Firm B investment dominates the Firm A investment, suggesting that, at $30 million, Firm B's equity is underpriced relative to that of Firm A. If investors observe the underpriced shares of Firm B and purchase them, they will drive their value up to $35 million, at which point the shares will be fairly priced.

What if Firm B's equity is *overpriced* at $45 million? In this case, the comparable investment will be $4.5 million in Firm B's equity, which leaves you only $3 million to invest in the risk-free bond. As shown in Panel D of Figure 15A.1, the investment in Firm B's equity and the risk-free bonds generates cash flows that are always less than the cash flows from the

Figure 15A.1

Illustrating the M&M Capital Structure Irrelevance Proposition

This example illustrates how the firm's capital structure (debt plus equity) does not affect the value of the firm where the two assumptions underlying the M&M capital structure theorem hold. Specifically,

- Panel A shows how we arrive at the valuation of Firm B's equity, given that the unlevered firm (Firm A) has a value of $75 million.
- Panel B illustrates the correct valuation of the levered firm's (Firm B) equity at $35 million.
- Panels C and D identify the arbitrage opportunities that arise where Firm B's equity is under- and overvalued, respectively.

The critical takeaway from this figure is that under the conditions assumed by M&M, the values of the unlevered firm (Firm A) and the levered firm (Firm B) must be equal, which means that each firm's capital structure is not important to the value of the firm.

(Panel A) Value of Firm B's Equity Assuming the M&M Proposition Holds

Assumptions ($ millions)	
Value of Firm A	$75
State of the Economy	**Distribution of Cash Flows for Year 1**
Recession	$50
Normal	100
Boom	150

In this panel, we assume that Firms A and B both have values of $75 million. Firm B has a debt obligation of $42 million next year, which means that the current value of Firm B's debt is $40 million and its equity is worth $35 million.

Valuing Firm B's Equity Today ($ millions)		
	Firm A	**Firm B**
Debt obligation in Year 1	—	$42.00
Borrowing rate	—	5%
Debt	$ —	$ 40
Equity	75	35
Firm value	$ 75	$ 75
$42/(1.05)		

Assume that you have $7.5 million to invest in either Firm A or Firm B and want to hold 10% of the acquired firm's equity. For Firm B, this requires only $3.5 million, so the remaining funds are invested in the risk-free security.

(Panel B) Firm B's Equity Is Valued Correctly at $35 Million

Investment in Firm B	
Value of Firm B's equity	$35.00 million
Amount invested	7.50 million
Price of 10% of Firm B's shares	3.50 million
Amount invested in risk-free debt	4.00 million

		Firm A	**Firm B**				
State of the Economy ($ millions)	**Cash Flow**	**Equity**	**Debt**	+	**Equity**	=	**Total**
Recession	$50	$ 5	$4.2		$ 0.8		$ 5
Normal	100	$10	$4.2		$ 5.8		$10
Boom	150	$15	$4.2		$10.8		$15

After investing the $7.5 million in Firm A's equity, you will receive $5, $10, or $15 million in cash flows, depending on the state of the economy. Similarly, summing the debt plus equity cash flows corresponding to purchasing 10% of Firm B and using the unused funds to purchase risk-free debt, the cash flows are identical to those you would receive from investing in Firm A. Thus, if Firm B's equity is priced at $35 million, you will be indifferent between buying stock in either of the two firms.

(FIGURE 15A.1 CONTINUED >> ON NEXT PAGE)

(Panel C) Firm B's Equity Is Underpriced at $30 Million

Investment in Firm B	
Value of Firm B's equity	$30.00 million
Amount invested	7.50 million
Price of 10% of Firm B's shares	3.00 million
Amount invested in risk-free debt	4.50 million

Cash flows from investing in Firm B are greater than from investing in Firm A because Firm B's equity is underpriced.

		Firm A	Firm B				
State of the Economy ($ millions)	Cash Flow	Equity	Debt	+	Equity	=	Total
Recession	$ 50	$ 5	$4.725		$0.8		$ 5.525
Normal	100	$10	$4.725		$5.8		$10.525
Boom	150	$15	$4.725		$0.8		$15.525

Firm A cash flows to the 10% investor. The result here is the same as before.

Firm B cash flows to the 10% investor. The cash flows in this instance are *higher* for Firm B, whose shares are underpriced. Since Firm B's equity is valued at $30 million, you can purchase 10% of the firm's shares using only $3 million; this gives you an additional $500,000 to invest in risk-free debt, which earns an additional $0.525 million in interest (i.e., $4.725 million – $4.2 million).

(Panel D) Firm B's Equity Is Overpriced at $45 Million

Investment in Firm B	
Value of Firm B's equity	$45.00 million
Amount invested	7.50 million
Price of 10% of Firm B's shares	4.50 million
Amount invested in risk-free debt	3.00 million

Cash flows from investing in Firm B are less than from investing in Firm A because Firm B's equity is overpriced.

		Firm A	Firm B				
State of the Economy ($ millions)	Cash Flow	Equity	Debt	+	Equity	=	Total
Recession	$50	$ 5	$3.15		$ 0.80		$ 3.95
Normal	100	$10	$3.15		$ 5.80		$ 8.95
Boom	150	$15	$3.15		$10.80		$13.95

Firm A cash flows to the 10% investor. The result here is the same as before.

Firm B cash flows to the 10% investor. The cash flows in this instance are *lower* for Firm B, whose shares are overpriced. Since Firm B's equity is valued at $45 million, you can purchase 10% of the firm's shares using $4.5 million; this leaves you only $3 million to invest in risk-free debt, which reduces your interest income by $1.05 million (i.e., $4.2 million – $3.15 million).

>> END FIGURE 15A.1

investment in Firm A. Obviously in this case you will prefer an investment in Firm A over Firm B. In this instance, investors will sell Firm B shares, thereby driving their price down to $35 million, at which point there is no longer be a profitable arbitrage opportunity.

Summing Up

So what does this mean? Very simply, under the two basic assumptions of the M&M capital structure theory, investors will force the values of otherwise identical firms to be equal even though they have different capital structures. The process by which investors force this to happen is called arbitrage, whereby they buy the shares of the undervalued firm and sell the shares of the overvalued firm.