16

FINANCIAL LEVERAGE AND CAPITAL STRUCTURE POLICY

ON FEBRUARY 16, 2011, famed bookseller Borders Group began a new chapter in its corporate life—Chapter 11 bankruptcy. The company had been faced with intense competition from rivals Amazon.com and Barnes & Noble. As a part of the bankruptcy process, the company planned to shut down about 200 of its 462 stores and change its focus to e-books and nonbook products. The company's biggest unsecured creditors were publishing companies. In fact, the six largest publishers were owed a combined $182 million and expected to get back only 25 cents on the dollar. Of course, Borders was not alone. The Honolulu Symphony Orchestra sounded a sour note, filing for Chapter 11 bankruptcy to reorganize its finances in 2009. It was later forced to switch to a Chapter 7 liquidation in February 2011. The assets to be auctioned included two grand pianos, a harpsichord, and 11 cowbells. Even pizza was not immune to bankruptcy. Round Table Pizza, which promised to serve "The Last Honest Pizza," and famed Chicago pizzeria Giordano's, home of "world famous" deep-dish pizza, both filed for bankruptcy within a week of each other in February 2011.

A firm's choice of how much debt it should have relative to equity is known as a capital structure decision. Such a choice has many implications for a firm and is far from being a settled issue in either theory or practice. In this chapter, we discuss the basic ideas underlying capital structures and how firms choose them.

A firm's capital structure is really just a reflection of its borrowing policy. Should we borrow a lot of money, or just a little? At first glance, it probably seems that debt is something to be avoided. After all, the more debt a firm has, the greater is the risk of bankruptcy. What we learn is that debt is really a double-edged sword, and, properly used, debt can be enormously beneficial to a firm.

A good understanding of the effects of debt financing is important simply because the role of debt is so misunderstood, and many firms (and individuals) are far too conservative in their use of debt. Having said this, we can also say that firms sometimes err in the opposite direction, becoming much too heavily indebted, with bankruptcy as the unfortunate consequence. Striking the right balance is what the capital structure issue is all about.

LEARNING OBJECTIVES

After studying this chapter, you should understand:

LO1 The effect of financial leverage.

LO2 The impact of taxes and bankruptcy on capital structure choice.

LO3 The essentials of the bankruptcy process.

Thus far, we have taken the firm's capital structure as given. Debt–equity ratios don't just drop on firms from the sky, of course, so now it's time to wonder where they come from. Going back to Chapter 1, recall that we refer to decisions about a firm's debt–equity ratio as *capital structure decisions.*[1]

For the most part, a firm can choose any capital structure it wants. If management so desired, a firm could issue some bonds and use the proceeds to buy back some stock, thereby increasing the debt–equity ratio. Alternatively, it could issue stock and use the money to pay off some debt, thereby reducing the debt–equity ratio. Activities such as these, which alter the firm's existing capital structure, are called capital *restructurings.* In general, such restructurings take place whenever the firm substitutes one capital structure for another while leaving the firm's assets unchanged.

Because the assets of a firm are not directly affected by a capital restructuring, we can examine the firm's capital structure decision separately from its other activities. This means that a firm can consider capital restructuring decisions in isolation from its investment decisions. In this chapter, then, we will ignore investment decisions and focus on the long-term financing, or capital structure, question.

What we will see in this chapter is that capital structure decisions can have important implications for the value of the firm and its cost of capital. We will also find that important elements of the capital structure decision are easy to identify, but precise measures of these elements are generally not obtainable. As a result, we are only able to give an incomplete answer to the question of what the best capital structure might be for a particular firm at a particular time.

16.1 The Capital Structure Question

How should a firm go about choosing its debt–equity ratio? Here, as always, we assume that the guiding principle is to choose the course of action that maximizes the value of a share of stock. As we discuss next, however, when it comes to capital structure decisions, this is essentially the same thing as maximizing the value of the whole firm, and, for convenience, we will tend to frame our discussion in terms of firm value.

FIRM VALUE AND STOCK VALUE: AN EXAMPLE

The following example illustrates that the capital structure that maximizes the value of the firm is the one financial managers should choose for the shareholders, so there is no conflict in our goals. To begin, suppose the market value of the J.J. Sprint Company is $1,000. The company currently has no debt, and J.J. Sprint's 100 shares sell for $10 each. Further suppose that J.J. Sprint restructures itself by borrowing $500 and then paying out the proceeds to shareholders as an extra dividend of $500/100 = $5 per share.

This restructuring will change the capital structure of the firm with no direct effect on the firm's assets. The immediate effect will be to increase debt and decrease equity. However, what will be the final impact of the restructuring? Table 16.1 illustrates three possible outcomes in addition to the original no-debt case. Notice that in Scenario II, the value of the firm is unchanged at $1,000. In Scenario I, firm value rises to $1,250; it falls by $250, to $750, in Scenario III. We haven't yet said what might lead to these changes. For now, we just take them as possible outcomes to illustrate a point.

Because our goal is to benefit the shareholders, we next examine, in Table 16.2, the net payoffs to the shareholders in these scenarios. We see that, if the value of the firm stays the same, shareholders will experience a capital loss exactly offsetting the extra dividend. This

[1]It is conventional to refer to decisions regarding debt and equity as *capital structure decisions*. However, the term *financial structure decisions* would be more accurate, and we use the terms interchangeably.

TABLE 16.1
Possible Firm Values: No Debt versus Debt plus Dividend

	No Debt	Debt plus Dividend I	Debt plus Dividend II	Debt plus Dividend III
Debt	$ 0	$ 500	$ 500	$500
Equity	1,000	750	500	250
Firm value	$1,000	$1,250	$1,000	$750

TABLE 16.2
Possible Payoffs to Shareholders: Debt plus Dividend

	Debt plus Dividend I	Debt plus Dividend II	Debt plus Dividend III
Equity value reduction	−$250	−$500	−$750
Dividends	500	500	500
Net effect	+$250	$ 0	−$250

is Scenario II. In Scenario I, the value of the firm increases to $1,250 and the shareholders come out ahead by $250. In other words, the restructuring has an NPV of $250 in this scenario. The NPV in Scenario III is −$250.

The key observation to make here is that the change in the value of the firm is the same as the net effect on the stockholders. Financial managers can therefore try to find the capital structure that maximizes the value of the firm. Put another way, the NPV rule applies to capital structure decisions, and the change in the value of the overall firm is the NPV of a restructuring. Thus, J.J. Sprint should borrow $500 if it expects Scenario I. The crucial question in determining a firm's capital structure is, of course, which scenario is likely to occur.

CAPITAL STRUCTURE AND THE COST OF CAPITAL

In Chapter 14, we discussed the concept of the firm's weighted average cost of capital, or WACC. You may recall that the WACC tells us that the firm's overall cost of capital is a weighted average of the costs of the various components of the firm's capital structure. When we described the WACC, we took the firm's capital structure as given. Thus, one important issue that we will want to explore in this chapter is what happens to the cost of capital when we vary the amount of debt financing, or the debt–equity ratio.

A primary reason for studying the WACC is that the value of the firm is maximized when the WACC is minimized. To see this, recall that the WACC is the appropriate discount rate for the firm's overall cash flows. Because values and discount rates move in opposite directions, minimizing the WACC will maximize the value of the firm's cash flows.

Thus, we will want to choose the firm's capital structure so that the WACC is minimized. For this reason, we will say that one capital structure is better than another if it results in a lower weighted average cost of capital. Further, we say that a particular debt–equity ratio represents the *optimal capital structure* if it results in the lowest possible WACC. This optimal capital structure is sometimes called the firm's *target* capital structure as well.

Concept Questions

16.1a Why should financial managers choose the capital structure that maximizes the value of the firm?

16.1b What is the relationship between the WACC and the value of the firm?

16.1c What is an optimal capital structure?

16.2 The Effect of Financial Leverage

The previous section described why the capital structure that produces the highest firm value (or the lowest cost of capital) is the one most beneficial to stockholders. In this section, we examine the impact of financial leverage on the payoffs to stockholders. As you may recall, *financial leverage* refers to the extent to which a firm relies on debt. The more debt financing a firm uses in its capital structure, the more financial leverage it employs.

As we describe, financial leverage can dramatically alter the payoffs to shareholders in the firm. Remarkably, however, financial leverage may not affect the overall cost of capital. If this is true, then a firm's capital structure is irrelevant because changes in capital structure won't affect the value of the firm. We will return to this issue a little later.

THE BASICS OF FINANCIAL LEVERAGE

We start by illustrating how financial leverage works. For now, we ignore the impact of taxes. Also, for ease of presentation, we describe the impact of leverage in terms of its effects on earnings per share, EPS, and return on equity, ROE. These are, of course, accounting numbers and, as such, are not our primary concern. Using cash flows instead of these accounting numbers would lead to precisely the same conclusions, but a little more work would be needed. We discuss the impact on market values in a subsequent section.

Financial Leverage, EPS, and ROE: An Example The Trans Am Corporation currently has no debt in its capital structure. The CFO, Ms. Morris, is considering a restructuring that would involve issuing debt and using the proceeds to buy back some of the outstanding equity. Table 16.3 presents both the current and proposed capital structures. As shown, the firm's assets have a market value of $8 million, and there are 400,000 shares outstanding. Because Trans Am is an all-equity firm, the price per share is $20.

The proposed debt issue would raise $4 million; the interest rate would be 10 percent. Because the stock sells for $20 per share, the $4 million in new debt would be used to purchase $4 million/20 = 200,000 shares, leaving 200,000. After the restructuring, Trans Am would have a capital structure that was 50 percent debt, so the debt–equity ratio would be 1. Notice that, for now, we assume that the stock price will remain at $20.

To investigate the impact of the proposed restructuring, Ms. Morris has prepared Table 16.4, which compares the firm's current capital structure to the proposed capital structure under three scenarios. The scenarios reflect different assumptions about the firm's EBIT. Under the expected scenario, the EBIT is $1 million. In the recession scenario, EBIT falls to $500,000. In the expansion scenario, it rises to $1.5 million.

To illustrate some of the calculations behind the figures in Table 16.4, consider the expansion case. EBIT is $1.5 million. With no debt (the current capital structure) and no taxes, net income is also $1.5 million. In this case, there are 400,000 shares worth $8 million total. EPS

TABLE 16.3

Current and Proposed Capital Structures for the Trans Am Corporation

	Current	Proposed
Assets	$8,000,000	$8,000,000
Debt	$ 0	$4,000,000
Equity	$8,000,000	$4,000,000
Debt–equity ratio	0	1
Share price	$ 20	$ 20
Shares outstanding	400,000	200,000
Interest rate	10%	10%

TABLE 16.4
Capital Structure Scenarios for the Trans Am Corporation

	Recession	Expected	Expansion
Current Capital Structure: No Debt			
EBIT	$500,000	$1,000,000	$1,500,000
Interest	0	0	0
Net income	$500,000	$1,000,000	$1,500,000
ROE	6.25%	12.50%	18.75%
EPS	$ 1.25	$ 2.50	$ 3.75
Proposed Capital Structure: Debt = $4 million			
EBIT	$500,000	$1,000,000	$1,500,000
Interest	400,000	400,000	400,000
Net income	$100,000	$ 600,000	$1,100,000
ROE	2.50%	15.00%	27.50%
EPS	$ .50	$ 3.00	$ 5.50

is therefore $1.5 million/400,000 = $3.75. Also, because accounting return on equity, ROE, is net income divided by total equity, ROE is $1.5 million/8 million = 18.75%.[2]

With $4 million in debt (the proposed capital structure), things are somewhat different. Because the interest rate is 10 percent, the interest bill is $400,000. With EBIT of $1.5 million, interest of $400,000, and no taxes, net income is $1.1 million. Now there are only 200,000 shares worth $4 million total. EPS is therefore $1.1 million/200,000 = $5.50, versus the $3.75 that we calculated in the previous scenario. Furthermore, ROE is $1.1 million/4 million = 27.5%. This is well above the 18.75 percent we calculated for the current capital structure.

EPS versus EBIT The impact of leverage is evident when the effect of the restructuring on EPS and ROE is examined. In particular, the variability in both EPS and ROE is much larger under the proposed capital structure. This illustrates how financial leverage acts to magnify gains and losses to shareholders.

In Figure 16.1, we take a closer look at the effect of the proposed restructuring. This figure plots earnings per share, EPS, against earnings before interest and taxes, EBIT, for the current and proposed capital structures. The first line, labeled "No debt," represents the case of no leverage. This line begins at the origin, indicating that EPS would be zero if EBIT were zero. From there, every $400,000 increase in EBIT increases EPS by $1 (because there are 400,000 shares outstanding).

The second line represents the proposed capital structure. Here, EPS is negative if EBIT is zero. This follows because $400,000 of interest must be paid regardless of the firm's profits. Because there are 200,000 shares in this case, the EPS is −$2 as shown. Similarly, if EBIT were $400,000, EPS would be exactly zero.

The important thing to notice in Figure 16.1 is that the slope of the line in this second case is steeper. In fact, for every $400,000 increase in EBIT, EPS rises by $2, so the line is twice as steep. This tells us that EPS is twice as sensitive to changes in EBIT because of the financial leverage employed.

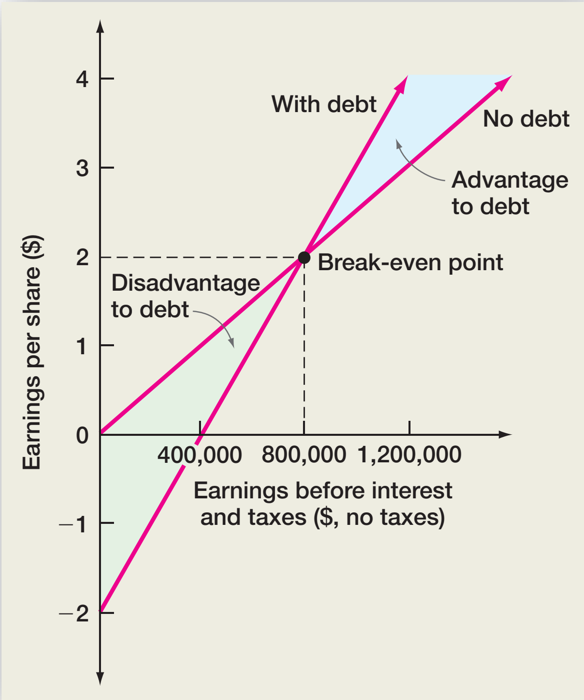
Another observation to make in Figure 16.1 is that the lines intersect. At that point, EPS is exactly the same for both capital structures. To find this point, note that EPS is equal to EBIT/400,000 in the no-debt case. In the with-debt case, EPS is (EBIT − $400,000)/200,000. If we set these equal to each other, EBIT is:

$$\begin{aligned}\text{EBIT}/400{,}000 &= (\text{EBIT} - \$400{,}000)/200{,}000\\ \text{EBIT} &= 2 \times (\text{EBIT} - \$400{,}000)\\ &= \$800{,}000\end{aligned}$$

[2]ROE is discussed in some detail in Chapter 3.

FIGURE 16.1

Financial Leverage: EPS and EBIT for the Trans Am Corporation



When EBIT is $800,000, EPS is $2 under either capital structure. This is labeled as the break-even point in Figure 16.1; we could also call it the indifference point. If EBIT is above this level, leverage is beneficial; if it is below this point, it is not.

There is another, more intuitive, way of seeing why the break-even point is $800,000. Notice that, if the firm has no debt and its EBIT is $800,000, its net income is also $800,000. In this case, the ROE is 10 percent. This is precisely the same as the interest rate on the debt, so the firm earns a return that is just sufficient to pay the interest.

EXAMPLE 16.1 Break-Even EBIT

The MPD Corporation has decided in favor of a capital restructuring. Currently, MPD uses no debt financing. Following the restructuring, however, debt will be $1 million. The interest rate on the debt will be 9 percent. MPD currently has 200,000 shares outstanding, and the price per share is $20. If the restructuring is expected to increase EPS, what is the minimum level for EBIT that MPD's management must be expecting? Ignore taxes in answering.

To answer, we calculate the break-even EBIT. At any EBIT above this, the increased financial leverage will increase EPS, so this will tell us the minimum level for EBIT. Under the old capital structure, EPS is simply EBIT/200,000. Under the new capital structure, the interest expense will be $1 million × .09 = $90,000. Furthermore, with the $1 million proceeds, MPD will repurchase $1 million/20 = 50,000 shares of stock, leaving 150,000 outstanding. EPS will thus be (EBIT − $90,000)/150,000.

Now that we know how to calculate EPS under both scenarios, we set them equal to each other and solve for the break-even EBIT:

$$\begin{aligned} \text{EBIT}/200{,}000 &= (\text{EBIT} - \$90{,}000)/150{,}000 \\ \text{EBIT} &= 4/3 \times (\text{EBIT} - \$90{,}000) \\ &= \$360{,}000 \end{aligned}$$

Verify that, in either case, EPS is $1.80 when EBIT is $360,000. Management at MPD is apparently of the opinion that EPS will exceed $1.80.

CORPORATE BORROWING AND HOMEMADE LEVERAGE

Based on Tables 16.3 and 16.4 and Figure 16.1, Ms. Morris draws the following conclusions:

1. The effect of financial leverage depends on the company's EBIT. When EBIT is relatively high, leverage is beneficial.
2. Under the expected scenario, leverage increases the returns to shareholders, as measured by both ROE and EPS.
3. Shareholders are exposed to more risk under the proposed capital structure because the EPS and ROE are much more sensitive to changes in EBIT in this case.
4. Because of the impact that financial leverage has on both the expected return to stockholders and the riskiness of the stock, capital structure is an important consideration.

The first three of these conclusions are clearly correct. Does the last conclusion necessarily follow? Surprisingly, the answer is no. As we discuss next, the reason is that shareholders can adjust the amount of financial leverage by borrowing and lending on their own. This use of personal borrowing to alter the degree of financial leverage is called **homemade leverage**.

homemade leverage The use of personal borrowing to change the overall amount of financial leverage to which the individual is exposed.

We will now illustrate that it actually makes no difference whether or not Trans Am adopts the proposed capital structure, because any stockholder who prefers the proposed capital structure can simply create it using homemade leverage. To begin, the first part of Table 16.5 shows what will happen to an investor who buys $2,000 worth of Trans Am stock if the proposed capital structure is adopted. This investor purchases 100 shares of stock. From Table 16.4, we know that EPS will be $.50, $3, or $5.50, so the total earnings for 100 shares will be either $50, $300, or $550 under the proposed capital structure.

Now, suppose that Trans Am does not adopt the proposed capital structure. In this case, EPS will be $1.25, $2.50, or $3.75. The second part of Table 16.5 demonstrates how a stockholder who prefers the payoffs under the proposed structure can create them using personal borrowing. To do this, the stockholder borrows $2,000 at 10 percent on her or his own. Our investor uses this amount, along with the original $2,000, to buy 200 shares of stock. As shown, the net payoffs are exactly the same as those for the proposed capital structure.

How did we know to borrow $2,000 to create the right payoffs? We are trying to replicate Trans Am's proposed capital structure at the personal level. The proposed capital structure results in a debt–equity ratio of 1. To replicate this structure at the personal level, the stockholder must borrow enough to create this same debt–equity ratio. Because the stockholder has $2,000 in equity invested, the borrowing of another $2,000 will create a personal debt–equity ratio of 1.

TABLE 16.5 Proposed Capital Structure versus Original Capital Structure with Homemade Leverage

Proposed Capital Structure			
	Recession	Expected	Expansion
EPS	$ .50	$ 3.00	$ 5.50
Earnings for 100 shares	50.00	300.00	550.00
Net cost = 100 shares × $20 = $2,000			
Original Capital Structure and Homemade Leverage			
EPS	$ 1.25	$ 2.50	$ 3.75
Earnings for 200 shares	250.00	500.00	750.00
Less: Interest on $2,000 at 10%	200.00	200.00	200.00
Net earnings	$ 50.00	$300.00	$550.00
Net cost = 200 shares × $20 − Amount borrowed = $4,000 − 2,000 = $2,000			

This example demonstrates that investors can always increase financial leverage themselves to create a different pattern of payoffs. It thus makes no difference whether Trans Am chooses the proposed capital structure.

EXAMPLE 16.2 **Unlevering the Stock**

In our Trans Am example, suppose management adopts the proposed capital structure. Further suppose that an investor who owned 100 shares preferred the original capital structure. Show how this investor could "unlever" the stock to re-create the original payoffs.

To create leverage, investors borrow on their own. To undo leverage, investors must lend money. In the case of Trans Am, the corporation borrowed an amount equal to half its value. The investor can unlever the stock by simply lending money in the same proportion. In this case, the investor sells 50 shares for $1,000 total and then lends the $1,000 at 10 percent. The payoffs are calculated in the following table:

	Recession	Expected	Expansion
EPS (proposed structure)	$ .50	$ 3.00	$ 5.50
Earnings for 50 shares	25.00	150.00	275.00
Plus: Interest on $1,000	100.00	100.00	100.00
Total payoff	$125.00	$250.00	$375.00

These are precisely the payoffs the investor would have experienced under the original capital structure.

Concept Questions

16.2a What is the impact of financial leverage on stockholders?
16.2b What is homemade leverage?
16.2c Why is Trans Am's capital structure irrelevant?

16.3 Capital Structure and the Cost of Equity Capital

We have seen that there is nothing special about corporate borrowing because investors can borrow or lend on their own. As a result, whichever capital structure Trans Am chooses, the stock price will be the same. Trans Am's capital structure is thus irrelevant, at least in the simple world we have examined.

Our Trans Am example is based on a famous argument advanced by two Nobel laureates, Franco Modigliani and Merton Miller, whom we will henceforth call M&M. What we illustrated for the Trans Am Corporation is a special case of **M&M Proposition I**. M&M Proposition I states that it is completely irrelevant how a firm chooses to arrange its finances.

M&M Proposition I
The proposition that the value of the firm is independent of the firm's capital structure.

M&M PROPOSITION I: THE PIE MODEL

One way to illustrate M&M Proposition I is to imagine two firms that are identical on the left side of the balance sheet. Their assets and operations are exactly the same. The right sides are different because the two firms finance their operations differently. In this case, we can view the capital structure question in terms of a "pie" model. Why we choose this

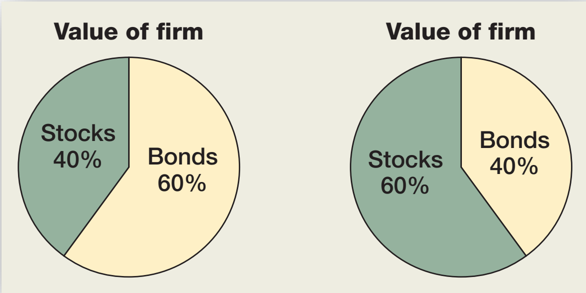


FIGURE 16.2
Two Pie Models of Capital Structure

name is apparent from Figure 16.2. Figure 16.2 gives two possible ways of cutting up the pie between the equity slice, E, and the debt slice, D: 40%–60% and 60%–40%. However, the size of the pie in Figure 16.2 is the same for both firms because the value of the assets is the same. This is precisely what M&M Proposition I states: The size of the pie doesn't depend on how it is sliced.

THE COST OF EQUITY AND FINANCIAL LEVERAGE: M&M PROPOSITION II

Although changing the capital structure of the firm does not change the firm's *total* value, it does cause important changes in the firm's debt and equity. We now examine what happens to a firm financed with debt and equity when the debt–equity ratio is changed. To simplify our analysis, we will continue to ignore taxes.

Based on our discussion in Chapter 14, if we ignore taxes, the weighted average cost of capital, WACC, is:

$$\text{WACC} = (E/V) \times R_E + (D/V) \times R_D$$

where $V = E + D$. We also saw that one way of interpreting the WACC is as the required return on the firm's overall assets. To remind us of this, we will use the symbol R_A to stand for the WACC and write:

$$R_A = (E/V) \times R_E + (D/V) \times R_D$$

If we rearrange this to solve for the cost of equity capital, we see that:

$$R_E = R_A + (R_A - R_D) \times (D/E) \quad \textbf{[16.1]}$$

This is the famous **M&M Proposition II**, which tells us that the cost of equity depends on three things: the required rate of return on the firm's assets, R_A; the firm's cost of debt, R_D; and the firm's debt–equity ratio, D/E.

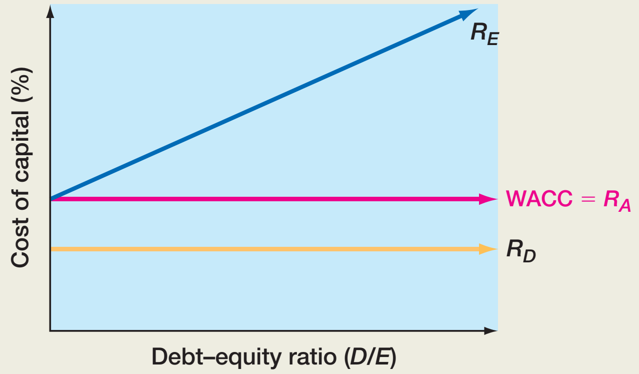
M&M Proposition II
The proposition that a firm's cost of equity capital is a positive linear function of the firm's capital structure.

Figure 16.3 summarizes our discussion thus far by plotting the cost of equity capital, R_E, against the debt–equity ratio. As shown, M&M Proposition II indicates that the cost of equity, R_E, is given by a straight line with a slope of $(R_A - R_D)$. The y-intercept corresponds to a firm with a debt–equity ratio of zero, so $R_A = R_E$ in that case. Figure 16.3 shows that as the firm raises its debt–equity ratio, the increase in leverage raises the risk of the equity and therefore the required return or cost of equity (R_E).

Notice in Figure 16.3 that the WACC doesn't depend on the debt–equity ratio; it's the same no matter what the debt–equity ratio is. This is another way of stating M&M Proposition I: The firm's overall cost of capital is unaffected by its capital structure. As illustrated, the fact that the cost of debt is lower than the cost of equity is exactly offset by the increase in the cost of equity from borrowing. In other words, the change in the capital structure weights (E/V and D/V) is exactly offset by the change in the cost of equity (R_E), so the WACC stays the same.

FIGURE 16.3

The Cost of Equity and the WACC: M&M Propositions I and II with No Taxes



$R_E = R_A + (R_A - R_D) \times (D/E)$ by M&M Proposition II

$R_A = \text{WACC} = \left(\frac{E}{V}\right) \times R_E + \left(\frac{D}{V}\right) \times R_D$

where $V = D + E$

EXAMPLE 16.3 The Cost of Equity Capital

The Ricardo Corporation has a weighted average cost of capital (ignoring taxes) of 12 percent. It can borrow at 8 percent. Assuming that Ricardo has a target capital structure of 80 percent equity and 20 percent debt, what is its cost of equity? What is the cost of equity if the target capital structure is 50 percent equity? Calculate the WACC using your answers to verify that it is the same.

According to M&M Proposition II, the cost of equity, R_E, is:

$$R_E = R_A + (R_A - R_D) \times (D/E)$$

In the first case, the debt–equity ratio is $.2/.8 = .25$, so the cost of the equity is:

$$\begin{aligned} R_E &= 12\% + (12\% - 8\%) \times .25 \\ &= 13\% \end{aligned}$$

In the second case, verify that the debt–equity ratio is 1.0, so the cost of equity is 16 percent.

We can now calculate the WACC assuming that the percentage of equity financing is 80 percent, the cost of equity is 13 percent, and the tax rate is zero:

$$\begin{aligned} \text{WACC} &= (E/V) \times R_E + (D/V) \times R_D \\ &= .80 \times 13\% + .20 \times 8\% \\ &= 12\% \end{aligned}$$

In the second case, the percentage of equity financing is 50 percent and the cost of equity is 16 percent. The WACC is:

$$\begin{aligned} \text{WACC} &= (E/V) \times R_E + (D/V) \times R_D \\ &= .50 \times 16\% + .50 \times 8\% \\ &= 12\% \end{aligned}$$

As we have calculated, the WACC is 12 percent in both cases.

IN THEIR OWN WORDS …

Merton H. Miller on Capital Structure: M&M 30 Years Later

How difficult it is to summarize briefly the contribution of these papers was brought home to me very clearly after Franco Modigliani was awarded the Nobel Prize in Economics, in part—but, of course, only in part—for his work in finance. The television camera crews from our local stations in Chicago immediately descended upon me. "We understand," they said, "that you worked with Modigliani some years back in developing these M&M theorems, and we wonder if you could explain them briefly to our television viewers." "How briefly?" I asked. "Oh, take 10 seconds," was the reply.

Ten seconds to explain the work of a lifetime! Ten seconds to describe two carefully reasoned articles, each running to more than 30 printed pages and each with 60 or so long footnotes! When they saw the look of dismay on my face, they said, "You don't have to go into details. Just give us the main points in simple, common sense terms."

The main point of the cost-of-capital article was, in principle at least, simple enough to make. It said that in an economist's ideal world, the total market value of all the securities issued by a firm would be governed by the earning power and risk of its underlying real assets and would be independent of how the mix of securities issued to finance it was divided between debt instruments and equity capital. Some corporate treasurers might well think that they could enhance total value by increasing the proportion of debt instruments because yields on debt instruments, given their lower risk, are, by and large, substantially below those on equity capital. But, under the ideal conditions assumed, the added risk to the shareholders from issuing more debt will raise required yields on the equity by just enough to offset the seeming gain from use of low-cost debt.

Such a summary would not only have been too long, but it relied on shorthand terms and concepts that are rich in connotations to economists, but hardly so to the general public. I thought, instead, of an analogy that we ourselves had invoked in the original paper. "Think of the firm," I said, "as a gigantic tub of whole milk. The farmer can sell the whole milk as is. Or he can separate out the cream and sell it at a considerably higher price than the whole milk would bring. (Selling cream is the analog of a firm selling low-yield and hence high-priced debt securities.) But, of course, what the farmer would have left would be skim milk, with low butterfat content, and that would sell for much less than whole milk. Skim milk corresponds to the levered equity. The M&M proposition says that if there were no costs of separation (and, of course, no government dairy support programs), the cream plus the skim milk would bring the same price as the whole milk."

The television people conferred among themselves for a while. They informed me that it was still too long, too complicated, and too academic. "Have you anything simpler?" they asked. I thought of another way in which the M&M proposition is presented that stresses the role of securities as devices for "partitioning" a firm's payoffs among the group of its capital suppliers. "Think of the firm," I said, "as a gigantic pizza, divided into quarters. If, now, you cut each quarter in half into eighths, the M&M proposition says that you will have more pieces, but not more pizza."

Once again whispered conversation. This time, they shut the lights off. They folded up their equipment. They thanked me for my cooperation. They said they would get back to me. But I knew that I had somehow lost my chance to start a new career as a packager of economic wisdom for TV viewers in convenient 10-second sound bites. Some have the talent for it; and some just don't.

The late Merton H. Miller was famous for his pathbreaking work with Franco Modigliani on corporate capital structure, cost of capital, and dividend policy. He received the Nobel Prize in Economics for his contributions shortly after this essay was prepared.

BUSINESS AND FINANCIAL RISK

M&M Proposition II shows that the firm's cost of equity can be broken down into two components. The first component, R_A, is the required return on the firm's assets overall, and it depends on the nature of the firm's operating activities. The risk inherent in a firm's operations is called the **business risk** of the firm's equity. Referring back to Chapter 13, note that this business risk depends on the systematic risk of the firm's assets. The greater a firm's business risk, the greater R_A will be, and, all other things being the same, the greater will be the firm's cost of equity.

business risk
The equity risk that comes from the nature of the firm's operating activities.

The second component in the cost of equity, $(R_A - R_D) \times (D/E)$, is determined by the firm's financial structure. For an all-equity firm, this component is zero. As the firm begins to rely on debt financing, the required return on equity rises. This occurs because the debt financing increases the risks borne by the stockholders. This extra risk that arises from the use of debt financing is called the **financial risk** of the firm's equity.

financial risk
The equity risk that comes from the financial policy (the capital structure) of the firm.

The total systematic risk of the firm's equity thus has two parts: business risk and financial risk. The first part (the business risk) depends on the firm's assets and operations and is not affected by capital structure. Given the firm's business risk (and its cost of debt), the second part (the financial risk) is completely determined by financial policy. As we have illustrated, the firm's cost of equity rises when the firm increases its use of financial leverage because the financial risk of the equity increases while the business risk remains the same.

Concept Questions

16.3a What does M&M Proposition I state?

16.3b What are the three determinants of a firm's cost of equity?

16.3c The total systematic risk of a firm's equity has two parts. What are they?

16.4 M&M Propositions I and II with Corporate Taxes

Debt has two distinguishing features that we have not taken into proper account. First, as we have mentioned in a number of places, interest paid on debt is tax deductible. This is good for the firm, and it may be an added benefit of debt financing. Second, failure to meet debt obligations can result in bankruptcy. This is not good for the firm, and it may be an added cost of debt financing. Because we haven't explicitly considered either of these two features of debt, we realize that we may get a different answer about capital structure once we do. Accordingly, we consider taxes in this section and bankruptcy in the next one.

We can start by considering what happens to M&M Propositions I and II when we consider the effect of corporate taxes. To do this, we will examine two firms: Firm U (unlevered) and Firm L (levered). These two firms are identical on the left side of the balance sheet, so their assets and operations are the same.

We assume that EBIT is expected to be \$1,000 every year forever for both firms. The difference between the firms is that Firm L has issued \$1,000 worth of perpetual bonds on which it pays 8 percent interest each year. The interest bill is thus $.08 \times \$1{,}000 = \$80$ every year forever. Also, we assume that the corporate tax rate is 30 percent.

For our two firms, U and L, we can now calculate the following:

	Firm U	Firm L
EBIT	\$1,000	\$1,000
Interest	0	80
Taxable income	\$1,000	\$ 920
Taxes (30%)	300	276
Net income	\$ 700	\$ 644

THE INTEREST TAX SHIELD

To simplify things, we will assume that depreciation is zero. We will also assume that capital spending is zero and that there are no changes in NWC. In this case, cash flow from assets is simply equal to EBIT − Taxes. For Firms U and L, we thus have:

Cash Flow from Assets	Firm U	Firm L
EBIT	$1,000	$1,000
−Taxes	300	276
Total	$ 700	$ 724

We immediately see that capital structure is now having some effect because the cash flows from U and L are not the same even though the two firms have identical assets.

To see what's going on, we can compute the cash flow to stockholders and bondholders:

Cash Flow	Firm U	Firm L
To stockholders	$700	$644
To bondholders	0	80
Total	$700	$724

What we are seeing is that the total cash flow to L is $24 more. This occurs because L's tax bill (which is a cash outflow) is $24 less. The fact that interest is deductible for tax purposes has generated a tax saving equal to the interest payment ($80) multiplied by the corporate tax rate (30 percent): $80 × .30 = $24. We call this tax saving the **interest tax shield**.

interest tax shield
The tax saving attained by a firm from interest expense.

TAXES AND M&M PROPOSITION I

Because the debt is perpetual, the same $24 shield will be generated every year forever. The aftertax cash flow to L will thus be the same $700 that U earns plus the $24 tax shield. Because L's cash flow is always $24 greater, Firm L is worth more than Firm U, the difference being the value of this $24 perpetuity.

Because the tax shield is generated by paying interest, it has the same risk as the debt, and 8 percent (the cost of debt) is therefore the appropriate discount rate. The value of the tax shield is thus:

$$\text{PV} = \frac{\$24}{.08} = \frac{.30 \times \$1{,}000 \times .08}{.08} = .30 \times \$1{,}000 = \$300$$

As our example illustrates, the present value of the interest tax shield can be written as:

$$\begin{aligned}\text{Present value of the interest tax shield} &= (T_C \times D \times R_D)/R_D \\ &= T_C \times D\end{aligned} \qquad [16.2]$$

We have now come up with another famous result, M&M Proposition I with corporate taxes. We have seen that the value of Firm L, V_L, exceeds the value of Firm U, V_U, by the present value of the interest tax shield, $T_C \times D$. M&M Proposition I with taxes therefore states that:

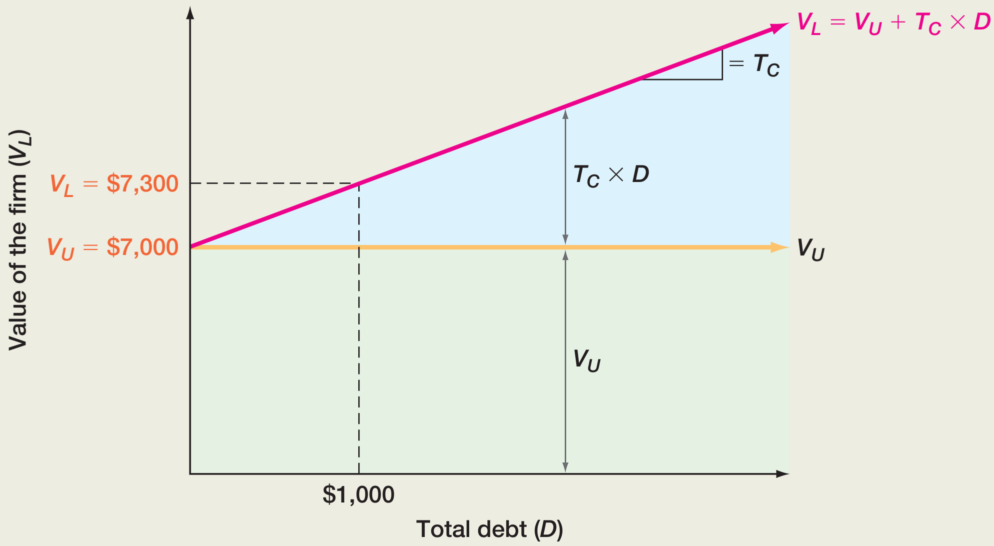
$$V_L = V_U + T_C \times D \qquad [16.3]$$

The effect of borrowing in this case is illustrated in Figure 16.4. We have plotted the value of the levered firm, V_L, against the amount of debt, D. M&M Proposition I with corporate taxes implies that the relationship is given by a straight line with a slope of T_C and a y-intercept of V_U.

In Figure 16.4, we have also drawn a horizontal line representing V_U. As indicated, the distance between the two lines is $T_C \times D$, the present value of the tax shield.

FIGURE 16.4

M&M Proposition I with Taxes



The value of the firm increases as total debt increases because of the interest tax shield. This is the basis of M&M Proposition I with taxes.

unlevered cost of capital
The cost of capital for a firm that has no debt.

Suppose that the cost of capital for Firm U is 10 percent. We will call this the **unlevered cost of capital**, and we will use the symbol R_U to represent it. We can think of R_U as the cost of capital a firm would have if it had no debt. Firm U's cash flow is $700 every year forever, and, because U has no debt, the appropriate discount rate is $R_U = 10\%$. The value of the unlevered firm, V_U, is simply:

$$\begin{aligned} V_U &= \frac{\text{EBIT} \times (1 - T_C)}{R_U} \\ &= \frac{\$700}{.10} \\ &= \$7{,}000 \end{aligned}$$

The value of the levered firm, V_L, is:

$$\begin{aligned} V_L &= V_U + T_C \times D \\ &= \$7{,}000 + .30 \times 1{,}000 \\ &= \$7{,}300 \end{aligned}$$

As Figure 16.4 indicates, the value of the firm goes up by $.30 for every $1 in debt. In other words, the NPV *per dollar* of debt is $.30. It is difficult to imagine why any corporation would not borrow to the absolute maximum under these circumstances.

The result of our analysis in this section is the realization that, once we include taxes, capital structure definitely matters. However, we immediately reach the illogical conclusion that the optimal capital structure is 100 percent debt.

TAXES, THE WACC, AND PROPOSITION II

We can also conclude that the best capital structure is 100 percent debt by examining the weighted average cost of capital. From Chapter 14, we know that once we consider the effect of taxes, the WACC is:

$$\text{WACC} = (E/V) \times R_E + (D/V) \times R_D \times (1 - T_C)$$

To calculate this WACC, we need to know the cost of equity. M&M Proposition II with corporate taxes states that the cost of equity is:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C) \quad [16.4]$$

To illustrate, recall that we saw a moment ago that Firm L is worth $7,300 total. Because the debt is worth $1,000, the equity must be worth $7,300 − 1,000 = $6,300. For Firm L, the cost of equity is thus:

$$\begin{aligned} R_E &= .10 + (.10 - .08) \times (\$1{,}000/6{,}300) \times (1 - .30) \\ &= 10.22\% \end{aligned}$$

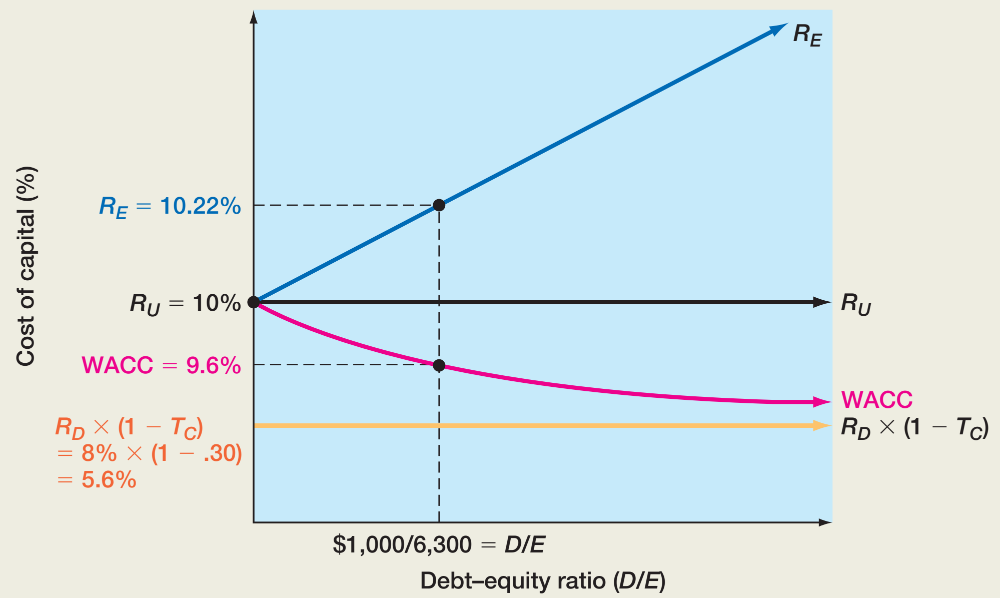
The weighted average cost of capital is:

$$\begin{aligned} \text{WACC} &= (\$6{,}300/7{,}300) \times 10.22\% + (1{,}000/7{,}300) \times 8\% \times (1 - .30) \\ &= 9.6\% \end{aligned}$$

Without debt, the WACC is over 10 percent; with debt, it is 9.6 percent. Therefore, the firm is better off with debt.

CONCLUSION

Figure 16.5 summarizes our discussion concerning the relationship between the cost of equity, the aftertax cost of debt, and the weighted average cost of capital. For reference, we have included R_U, the unlevered cost of capital. In Figure 16.5, we have the debt–equity



M&M Proposition I with taxes implies that a firm's WACC decreases as the firm relies more heavily on debt financing:

$$\text{WACC} = \left(\frac{E}{V}\right) \times R_E + \left(\frac{D}{V}\right) \times R_D \times (1 - T_C)$$

M&M Proposition II with taxes implies that a firm's cost of equity, R_E, rises as the firm relies more heavily on debt financing:
$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C)$

FIGURE 16.5
The Cost of Equity and the WACC: M&M Proposition II with Taxes

TABLE 16.6
Modigliani and Miller Summary

I. The No-Tax Case

A. Proposition I: The value of the firm levered (V_L) is equal to the value of the firm unlevered (V_U):

$$V_L = V_U$$

Implications of Proposition I:

1. A firm's capital structure is irrelevant.
2. A firm's weighted average cost of capital (WACC) is the same no matter what mixture of debt and equity is used to finance the firm.

B. Proposition II: The cost of equity, R_E, is:

$$R_E = R_A + (R_A - R_D) \times (D/E)$$

where R_A is the WACC, R_D is the cost of debt, and D/E is the debt–equity ratio.

Implications of Proposition II:

1. The cost of equity rises as the firm increases its use of debt financing.
2. The risk of the equity depends on two things: the riskiness of the firm's operations *(business risk)* and the degree of financial leverage *(financial risk).* Business risk determines R_A; financial risk is determined by D/E.

II. The Tax Case

A. Proposition I with taxes: The value of the firm levered (V_L) is equal to the value of the firm unlevered (V_U) plus the present value of the interest tax shield:

$$V_L = V_U + T_C \times D$$

where T_C is the corporate tax rate and D is the amount of debt.

Implications of Proposition I:

1. Debt financing is highly advantageous, and, in the extreme, a firm's optimal capital structure is 100 percent debt.
2. A firm's weighted average cost of capital (WACC) decreases as the firm relies more heavily on debt financing.

B. Proposition II with taxes: The cost of equity, R_E, is:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C)$$

where R_U is the *unlevered cost of capital*—that is, the cost of capital for the firm if it has no debt. Unlike the case with Proposition I, the general implications of Proposition II are the same whether there are taxes or not.

ratio on the horizontal axis. Notice how the WACC declines as the debt–equity ratio grows. This illustrates again that the more debt the firm uses, the lower is its WACC. Table 16.6 summarizes the key results of our analysis of the M&M propositions for future reference.

EXAMPLE 16.4 The Cost of Equity and the Value of the Firm

This is a comprehensive example that illustrates most of the points we have discussed thus far. You are given the following information for the Format Co.:

$$\begin{aligned} \text{EBIT} &= \$151.52 \\ T_C &= .34 \\ D &= \$500 \\ R_U &= .20 \end{aligned}$$

The cost of debt capital is 10 percent. What is the value of Format's equity? What is the cost of equity capital for Format? What is the WACC?

This one's easier than it looks. Remember that all the cash flows are perpetuities. The value of the firm if it has no debt, V_U, is:

$$V_U = \frac{\text{EBIT} - \text{Taxes}}{R_U} = \frac{\text{EBIT} \times (1 - T_C)}{R_U}$$
$$= \frac{\$100}{.20}$$
$$= \$500$$

From M&M Proposition I with taxes, we know that the value of the firm with debt is:

$$V_L = V_U + T_C \times D$$
$$= \$500 + .34 \times 500$$
$$= \$670$$

Because the firm is worth \$670 total and the debt is worth \$500, the equity is worth \$170:

$$E = V_L - D$$
$$= \$670 - 500$$
$$= \$170$$

Based on M&M Proposition II with taxes, the cost of equity is:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C)$$
$$= .20 + (.20 - .10) \times (\$500/170) \times (1 - .34)$$
$$= 39.4\%$$

Finally, the WACC is:

$$\text{WACC} = (\$170/670) \times 39.4\% + (500/670) \times 10\% \times (1 - .34)$$
$$= 14.92\%$$

Notice that this is substantially lower than the cost of capital for the firm with no debt ($R_U = 20\%$), so debt financing is highly advantageous.

Concept Questions

16.4a What is the relationship between the value of an unlevered firm and the value of a levered firm once we consider the effect of corporate taxes?

16.4b If we consider only the effect of taxes, what is the optimal capital structure?

Bankruptcy Costs 16.5

One limiting factor affecting the amount of debt a firm might use comes in the form of *bankruptcy costs*. As the debt–equity ratio rises, so too does the probability that the firm will be unable to pay its bondholders what was promised to them. When this happens, ownership of the firm's assets is ultimately transferred from the stockholders to the bondholders.

In principle, a firm becomes bankrupt when the value of its assets equals the value of its debt. When this occurs, the value of equity is zero, and the stockholders turn over control of the firm to the bondholders. When this takes place, the bondholders hold assets whose value is exactly equal to what is owed on the debt. In a perfect world, there are no costs associated with this transfer of ownership, and the bondholders don't lose anything.

This idealized view of bankruptcy is not, of course, what happens in the real world. Ironically, it is expensive to go bankrupt. As we discuss, the costs associated with bankruptcy may eventually offset the tax-related gains from leverage.

DIRECT BANKRUPTCY COSTS

When the value of a firm's assets equals the value of its debt, then the firm is economically bankrupt in the sense that the equity has no value. However, the formal turning over of the assets to the bondholders is a *legal* process, not an economic one. There are legal and administrative costs to bankruptcy, and it has been remarked that bankruptcies are to lawyers what blood is to sharks.

For example, in September 2008, famed investment bank Lehman Brothers filed for bankruptcy in the largest U.S. bankruptcy to date. As of early 2011, the bankruptcy was still not completed. The direct bankruptcy costs were eye-watering: Lehman was expected to spend almost $2 billion (that's "billion" with a "b") on lawyers, accountants, consultants, and examiners for its U.S. and European operations. The individual costs submitted by one law firm were equally amazing: The firm requested $200,000 for business meals, $439,000 for computerized and other research, $115,000 for local transportation, and $287,000 for copying charges at 10 cents per page. The other costs of bankruptcy may have been even larger. Some experts estimated that because Lehman rushed into bankruptcy it lost out on $75 billion that it could have earned if the sale of many of its assets had been better planned.

Because of the expenses associated with bankruptcy, bondholders won't get all that they are owed. Some fraction of the firm's assets will "disappear" in the legal process of going bankrupt. These are the legal and administrative expenses associated with the bankruptcy proceeding. We call these costs **direct bankruptcy costs**.

direct bankruptcy costs
The costs that are directly associated with bankruptcy, such as legal and administrative expenses.

These direct bankruptcy costs are a disincentive to debt financing. If a firm goes bankrupt, then, suddenly, a piece of the firm disappears. This amounts to a bankruptcy "tax." So a firm faces a trade-off: Borrowing saves a firm money on its corporate taxes, but the more a firm borrows, the more likely it is that the firm will become bankrupt and have to pay the bankruptcy tax.

INDIRECT BANKRUPTCY COSTS

Because it is expensive to go bankrupt, a firm will spend resources to avoid doing so. When a firm is having significant problems in meeting its debt obligations, we say that it is experiencing financial distress. Some financially distressed firms ultimately file for bankruptcy, but most do not because they are able to recover or otherwise survive.

The costs of avoiding a bankruptcy filing incurred by a financially distressed firm are called **indirect bankruptcy costs**. We use the term **financial distress costs** to refer generically to the direct and indirect costs associated with going bankrupt or avoiding a bankruptcy filing.

indirect bankruptcy costs
The costs of avoiding a bankruptcy filing incurred by a financially distressed firm.

financial distress costs
The direct and indirect costs associated with going bankrupt or experiencing financial distress.

The problems that come up in financial distress are particularly severe, and the financial distress costs are thus larger, when the stockholders and the bondholders are different groups. Until the firm is legally bankrupt, the stockholders control it. They, of course, will take actions in their own economic interests. Because the stockholders can be wiped out in a legal bankruptcy, they have a very strong incentive to avoid a bankruptcy filing.

The bondholders, on the other hand, are primarily concerned with protecting the value of the firm's assets and will try to take control away from stockholders. They have a strong incentive to seek bankruptcy to protect their interests and keep stockholders from further dissipating the assets of the firm. The net effect of all this fighting is that a long, drawn-out, and potentially quite expensive legal battle gets started.

Meanwhile, as the wheels of justice turn in their ponderous way, the assets of the firm lose value because management is busy trying to avoid bankruptcy instead of running the business. Normal operations are disrupted, and sales are lost. Valuable employees leave, potentially fruitful programs are dropped to preserve cash, and otherwise profitable investments are not taken.

For example, in 2008, both General Motors and Chrysler were experiencing significant financial difficulty, and many people felt that one or both companies would eventually file for bankruptcy (both later did). As a result of the bad news surrounding them, there was a loss of confidence in the companies' automobiles. A study showed that 75 percent of Americans would not purchase an automobile from a bankrupt company because the company might not honor the warranty, and it might be difficult to obtain replacement parts. This concern resulted in lost potential sales for both companies, which only added to their financial distress.

These are all indirect bankruptcy costs, or costs of financial distress. Whether or not the firm ultimately goes bankrupt, the net effect is a loss of value because the firm chose to use debt in its capital structure. It is this possibility of loss that limits the amount of debt that a firm will choose to use.

Concept Questions

16.5a What are direct bankruptcy costs?

16.5b What are indirect bankruptcy costs?

Optimal Capital Structure 16.6

Our previous two sections have established the basis for determining an optimal capital structure. A firm will borrow because the interest tax shield is valuable. At relatively low debt levels, the probability of bankruptcy and financial distress is low, and the benefit from debt outweighs the cost. At very high debt levels, the possibility of financial distress is a chronic, ongoing problem for the firm, so the benefit from debt financing may be more than offset by the financial distress costs. Based on our discussion, it would appear that an optimal capital structure exists somewhere in between these extremes.

THE STATIC THEORY OF CAPITAL STRUCTURE

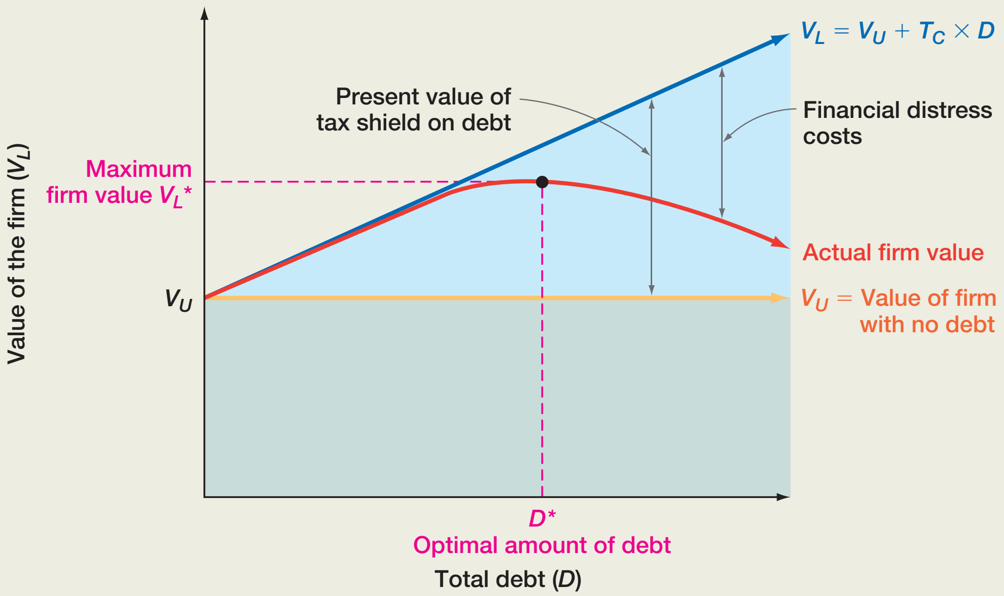
The theory of capital structure that we have outlined is called the **static theory of capital structure**. It says that firms borrow up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress. We call this the static theory because it assumes that the firm is fixed in terms of its assets and operations and it considers only possible changes in the debt–equity ratio.

static theory of capital structure
The theory that a firm borrows up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress.

The static theory is illustrated in Figure 16.6, which plots the value of the firm, V_L, against the amount of debt, D. In Figure 16.6, we have drawn lines corresponding to three different stories. The first represents M&M Proposition I with no taxes. This is the horizontal line extending from V_U, and it indicates that the value of the firm is unaffected by its capital structure. The second case, M&M Proposition I with corporate taxes, is represented by the upward-sloping straight line. These two cases are exactly the same as the ones we previously illustrated in Figure 16.4.

The third case in Figure 16.6 illustrates our current discussion: The value of the firm rises to a maximum and then declines beyond that point. This is the picture that we get

FIGURE 16.6 The Static Theory of Capital Structure: The Optimal Capital Structure and the Value of the Firm



According to the static theory, the gain from the tax shield on debt is offset by financial distress costs. An optimal capital structure exists that just balances the additional gain from leverage against the added financial distress cost.

from our static theory. The maximum value of the firm, V_L*, is reached at D*, so this point represents the optimal amount of borrowing. Put another way, the firm's optimal capital structure is composed of D^*/V_L^* in debt and $(1 - D^*/V_L^*)$ in equity.

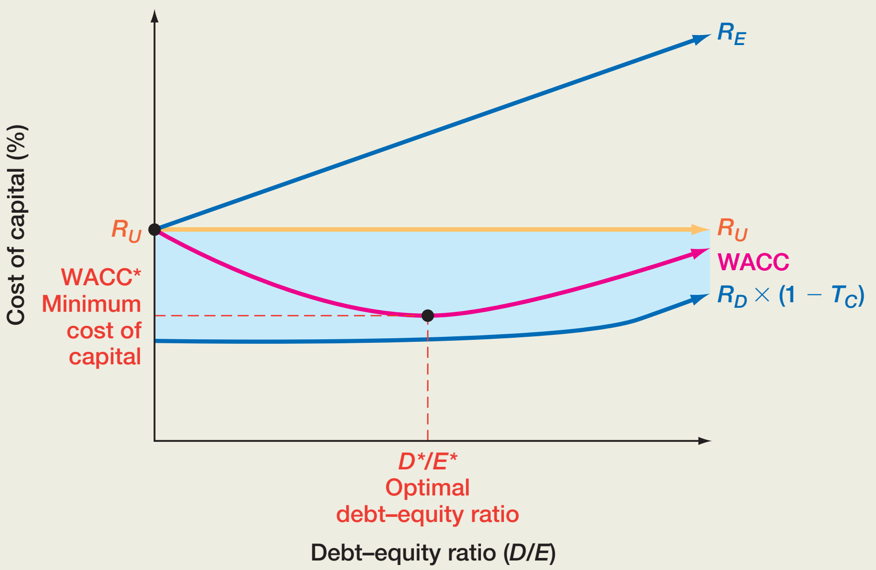
The final thing to notice in Figure 16.6 is that the difference between the value of the firm in our static theory and the M&M value of the firm with taxes is the loss in value from the possibility of financial distress. Also, the difference between the static theory value of the firm and the M&M value with no taxes is the gain from leverage, net of distress costs.

OPTIMAL CAPITAL STRUCTURE AND THE COST OF CAPITAL

As we discussed earlier, the capital structure that maximizes the value of the firm is also the one that minimizes the cost of capital. Figure 16.7 illustrates the static theory of capital structure in terms of the weighted average cost of capital and the costs of debt and equity. Notice in Figure 16.7 that we have plotted the various capital costs against the debt–equity ratio, D/E.

Figure 16.7 is much the same as Figure 16.5 except that we have added a new line for the WACC. This line, which corresponds to the static theory, declines at first. This occurs because the aftertax cost of debt is cheaper than equity, so, at least initially, the overall cost of capital declines.

At some point, the cost of debt begins to rise, and the fact that debt is cheaper than equity is more than offset by the financial distress costs. From this point, further increases in debt actually increase the WACC. As illustrated, the minimum WACC* occurs at the point D^*/E^*, just as we described before.



According to the static theory, the WACC falls initially because of the tax advantage of debt. Beyond the point D^*/E^*, it begins to rise because of financial distress costs.

FIGURE 16.7

The Static Theory of Capital Structure: The Optimal Capital Structure and the Cost of Capital

OPTIMAL CAPITAL STRUCTURE: A RECAP

With the help of Figure 16.8, we can recap (no pun intended) our discussion of capital structure and cost of capital. As we have noted, there are essentially three cases. We will use the simplest of the three cases as a starting point and then build up to the static theory of capital structure. Along the way, we will pay particular attention to the connection between capital structure, firm value, and cost of capital.

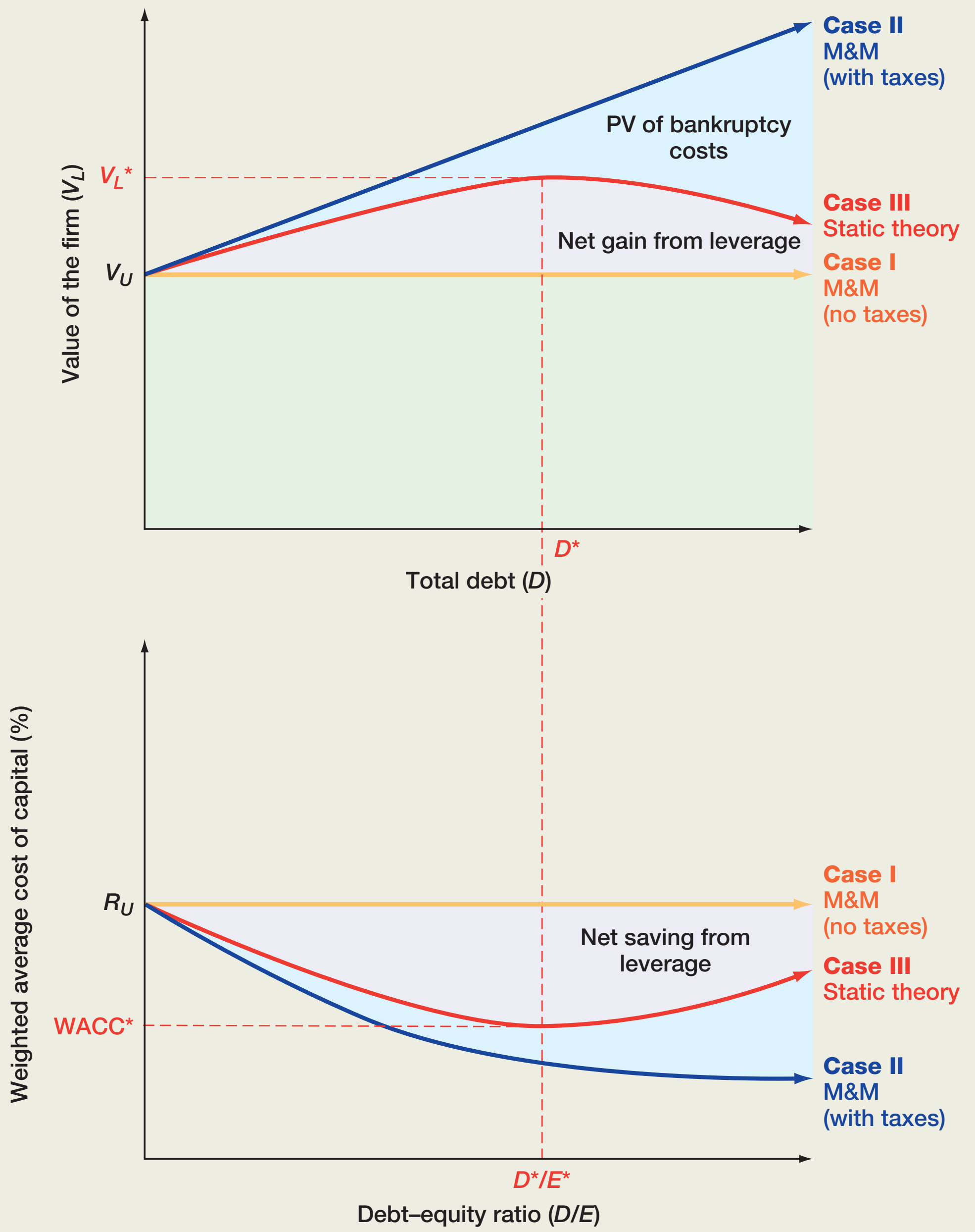
Figure 16.8 presents the original Modigliani and Miller no-tax, no-bankruptcy argument as Case I. This is the most basic case. In the top part of the figure, we have plotted the value of the firm, V_L, against total debt, D. When there are no taxes, bankruptcy costs, or other real-world imperfections, we know that the total value of the firm is not affected by its debt policy, so V_L is simply constant. The bottom part of Figure 16.8 tells the same story in terms of the cost of capital. Here, the weighted average cost of capital, WACC, is plotted against the debt–equity ratio, D/E. As with total firm value, the overall cost of capital is not affected by debt policy in this basic case, so the WACC is constant.

Next, we consider what happens to the original M&M argument once taxes are introduced. As Case II illustrates, we now see that the firm's value critically depends on its debt policy. The more the firm borrows, the more it is worth. From our earlier discussion, we know this happens because interest payments are tax deductible, and the gain in firm value is just equal to the present value of the interest tax shield.

In the bottom part of Figure 16.8, notice how the WACC declines as the firm uses more and more debt financing. As the firm increases its financial leverage, the cost of equity does increase; but this increase is more than offset by the tax break associated with debt financing. As a result, the firm's overall cost of capital declines.

To finish our story, we include the impact of bankruptcy or financial distress costs to get Case III. As shown in the top part of Figure 16.8, the value of the firm will not be as large as we previously indicated. The reason is that the firm's value is reduced by the present

FIGURE 16.8
The Capital Structure Question



Case I
With no taxes or bankruptcy costs, the value of the firm and its weighted average cost of capital are not affected by capital structures.

Case II
With corporate taxes and no bankruptcy costs, the value of the firm increases and the weighted average cost of capital decreases as the amount of debt goes up.

Case III
With corporate taxes and bankruptcy costs, the value of the firm, V_L, reaches a maximum at D^*, the point representing the optimal amount of borrowing. At the same time, the weighted average cost of capital, WACC, is minimized at D^*/E^*.

value of the potential future bankruptcy costs. These costs grow as the firm borrows more and more, and they eventually overwhelm the tax advantage of debt financing. The optimal capital structure occurs at D^*, the point at which the tax saving from an additional dollar in debt financing is exactly balanced by the increased bankruptcy costs associated with the additional borrowing. This is the essence of the static theory of capital structure.

The bottom part of Figure 16.8 presents the optimal capital structure in terms of the cost of capital. Corresponding to D^*, the optimal debt level, is the optimal debt–equity ratio, D^*/E^*. At this level of debt financing, the lowest possible weighted average cost of capital, WACC*, occurs.

CAPITAL STRUCTURE: SOME MANAGERIAL RECOMMENDATIONS

The static model that we have described is not capable of identifying a precise optimal capital structure, but it does point out two of the more relevant factors: taxes and financial distress. We can draw some limited conclusions concerning these.

Taxes First of all, the tax benefit from leverage is obviously important only to firms that are in a tax-paying position. Firms with substantial accumulated losses will get little value from the interest tax shield. Furthermore, firms that have substantial tax shields from other sources, such as depreciation, will get less benefit from leverage.

Also, not all firms have the same tax rate. The higher the tax rate, the greater the incentive to borrow.

Financial Distress Firms with a greater risk of experiencing financial distress will borrow less than firms with a lower risk of financial distress. For example, all other things being equal, the greater the volatility in EBIT, the less a firm should borrow.

In addition, financial distress is more costly for some firms than others. The costs of financial distress depend primarily on the firm's assets. In particular, financial distress costs will be determined by how easily ownership of those assets can be transferred.

For example, a firm with mostly tangible assets that can be sold without great loss in value will have an incentive to borrow more. For firms that rely heavily on intangibles, such as employee talent or growth opportunities, debt will be less attractive because these assets effectively cannot be sold.

Concept Questions

16.6a Can you describe the trade-off that defines the static theory of capital structure?

16.6b What are the important factors in making capital structure decisions?

The Pie Again 16.7

Although it is comforting to know that the firm might have an optimal capital structure when we take account of such real-world matters as taxes and financial distress costs, it is disquieting to see the elegant original M&M intuition (that is, the no-tax version) fall apart in the face of these matters.

Critics of the M&M theory often say that it fails to hold as soon as we add in real-world issues and that the M&M theory is really just that: a theory that doesn't have much to say about the real world that we live in. In fact, they would argue that it is the M&M theory that is irrelevant, not capital structure. As we discuss next, however, taking that view blinds critics to the real value of the M&M theory.

THE EXTENDED PIE MODEL

To illustrate the value of the original M&M intuition, we briefly consider an expanded version of the pie model that we introduced earlier. In the extended pie model, taxes just represent another claim on the cash flows of the firm. Because taxes are reduced as leverage is increased, the value of the government's claim (G) on the firm's cash flows decreases with leverage.

Bankruptcy costs are also a claim on the cash flows. They come into play as the firm comes close to bankruptcy and has to alter its behavior to attempt to stave off the event itself, and they become large when bankruptcy actually takes place. Thus, the value of this claim (B) on the cash flows rises with the debt–equity ratio.

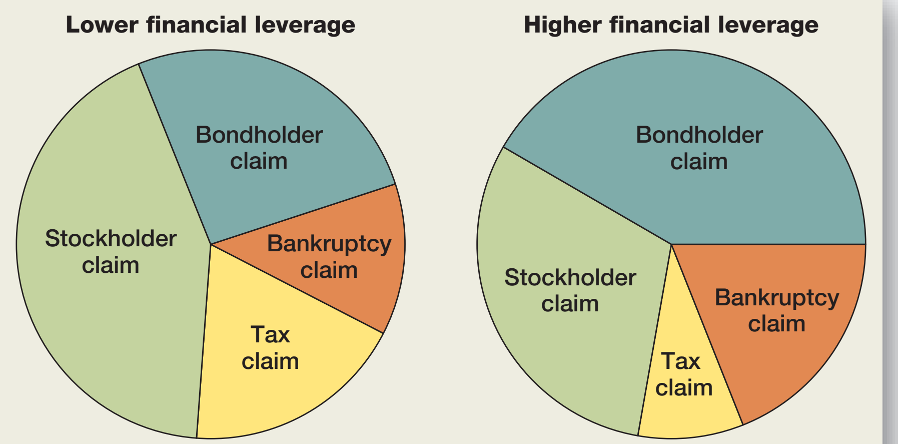
The extended pie theory simply holds that all of these claims can be paid from only one source: the cash flows (CF) of the firm. Algebraically, we must have:

CF = Payments to stockholders + Payments to creditors
+ Payments to the government
+ Payments to bankruptcy courts and lawyers
+ Payments to any and all other claimants to the cash flows of the firm

The extended pie model is illustrated in Figure 16.9. Notice that we have added a few slices for the additional groups. Notice also the change in the relative sizes of the slices as the firm's use of debt financing is increased.

With the list we have developed, we have not even begun to exhaust the potential claims to the firm's cash flows. To give an unusual example, we might say that everyone reading this book has an economic claim on the cash flows of General Motors. After all, if you are injured in an accident, you might sue GM, and, win or lose, GM will expend some of its cash flow in dealing with the matter. For GM, or any other company, there should thus be a slice of the pie representing potential lawsuits. This is the essence of the M&M intuition

FIGURE 16.9
The Extended Pie Model



In the extended pie model, the value of all the claims against the firm's cash flows is not affected by capital structure, but the *relative* values of claims change as the amount of debt financing is increased.

and theory: The value of the firm depends on the total cash flow of the firm. The firm's capital structure just cuts that cash flow up into slices without altering the total. What we recognize now is that the stockholders and the bondholders may not be the only ones who can claim a slice.

MARKETED CLAIMS VERSUS NONMARKETED CLAIMS

With our extended pie model, there is an important distinction between claims such as those of stockholders and bondholders, on the one hand, and those of the government and potential litigants in lawsuits on the other. The first set of claims are *marketed claims,* and the second set are *nonmarketed claims.* A key difference is that the marketed claims can be bought and sold in financial markets and the nonmarketed claims cannot.

When we speak of the value of the firm, we are generally referring to just the value of the marketed claims, V_M, and not the value of the nonmarketed claims, V_N. If we write V_T for the total value of *all* the claims against a corporation's cash flows, then:

$$\begin{aligned} V_T &= E + D + G + B + \cdots \\ &= V_M + V_N \end{aligned}$$

The essence of our extended pie model is that this total value, V_T, of all the claims to the firm's cash flows is unaltered by capital structure. However, the value of the marketed claims, V_M, may be affected by changes in the capital structure.

Based on the pie theory, any increase in V_M must imply an identical decrease in V_N. The optimal capital structure is thus the one that maximizes the value of the marketed claims or, equivalently, minimizes the value of nonmarketed claims such as taxes and bankruptcy costs.

Concept Questions

16.7a What are some of the claims to a firm's cash flows?

16.7b What is the difference between a marketed claim and a nonmarketed claim?

16.7c What does the extended pie model say about the value of all the claims to a firm's cash flows?

The Pecking-Order Theory 16.8

The static theory we have developed in this chapter has dominated thinking about capital structure for a long time, but it has some shortcomings. Perhaps the most obvious is that many large, financially sophisticated, and highly profitable firms use little debt. This is the opposite of what we would expect. Under the static theory, these are the firms that should use the *most* debt because there is little risk of bankruptcy and the value of the tax shield is substantial. Why do they use so little debt? The pecking-order theory, which we consider next, may be part of the answer.

INTERNAL FINANCING AND THE PECKING ORDER

The pecking-order theory is an alternative to the static theory. A key element in the pecking-order theory is that firms prefer to use internal financing whenever possible.

A simple reason is that selling securities to raise cash can be expensive, so it makes sense to avoid doing so if possible. If a firm is very profitable, it might never need external financing; so it would end up with little or no debt. For example, in early 2011, Google's balance sheet showed assets of $57.9 billion, of which almost $35 billion was classified as either cash or marketable securities. In fact, Google held so much of its assets in the form of securities that, at one point, it was in danger of being regulated as a mutual fund!

There is a more subtle reason that companies may prefer internal financing. Suppose you are the manager of a firm, and you need to raise external capital to fund a new venture. As an insider, you are privy to a lot of information that isn't known to the public. Based on your knowledge, the firm's future prospects are considerably brighter than outside investors realize. As a result, you think your stock is currently undervalued. Should you issue debt or equity to finance the new venture?

If you think about it, you definitely don't want to issue equity in this case. The reason is that your stock is undervalued, and you don't want to sell it too cheaply. So, you issue debt instead.

Would you ever want to issue equity? Suppose you thought your firm's stock was overvalued. It makes sense to raise money at inflated prices, but a problem crops up. If you try to sell equity, investors will realize that the shares are probably overvalued, and your stock price will take a hit. In other words, if you try to raise money by selling equity, you run the risk of signaling to investors that the price is too high. In fact, in the real world, companies rarely sell new equity, and the market reacts negatively to such sales when they occur.

So, we have a pecking order. Companies will use internal financing first. Then, they will issue debt if necessary. Equity will be sold pretty much as a last resort.

IMPLICATIONS OF THE PECKING ORDER

The pecking-order theory has several significant implications, a couple of which are at odds with our static trade-off theory:

1. *No target capital structure:* Under the pecking-order theory, there is no target or optimal debt–equity ratio. Instead, a firm's capital structure is determined by its need for external financing, which dictates the amount of debt the firm will have.
2. *Profitable firms use less debt:* Because profitable firms have greater internal cash flow, they will need less external financing and will therefore have less debt. As we mentioned earlier, this is a pattern that we seem to observe, at least for some companies.
3. *Companies will want financial slack:* To avoid selling new equity, companies will want to stockpile internally generated cash. Such a cash reserve is known as *financial slack*. It gives management the ability to finance projects as they appear and to move quickly if necessary.

Which theory, static trade-off or pecking order, is correct? Financial researchers have not reached a definitive conclusion on this issue, but we can make a few observations. The trade-off theory speaks more to long-run financial goals or strategies. The issues of tax shields and financial distress costs are plainly important in that context. The pecking-order theory is more concerned with the shorter-run, tactical issue of raising external funds to finance investments. So both theories are useful ways of understanding corporate use of debt. For example, it is probably the case that firms have long-run, target capital structures, but it is also probably true that they will deviate from those long-run targets as needed to avoid issuing new equity.