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Part IV

Long-Term Financing Decisions

Long-term financing decisions concern how the firm finances its assets over the long-term (that is, for more than one year). At issue are the proper balance between debt and equity financing, and the procedures associated with raising money from the various long-term financing sources. Chapter 13 begins this section with an introduction to capital structure theory, which examines the aspects of financing with debt and financing with equity and how the blend affects the firm. Chapter 14 covers long-term debt financing and financing from sources that are similar to long-term debt: preferred stock and leasing. Chapter 15 covers financing obtained from the firm's owners in the form of common stock ownership. Chapter 16 ends the section with the study of what to do with the firm's excess funds, examining the factors that lead to either distributing the funds to stockholders in the form of dividends or retaining it for growth.

CHAPTERS

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13 Capital Structure Basics

"The Lord forbid that I should be out of debt, as if, indeed, I could not be trusted."

—François Rabelais

A Popcorn Venture

Jason is a college student who wants to start his own business. Jason's business idea is to sell popcorn from a cart, just as he has seen done in the downtown area of the city in which he lives. The downtown vendor sells about 500 bags of popcorn a day, and Jason thinks he might be able to do as well with a similar popcorn stand near the college in his town.

However, the wagon contains both a popcorn-making machine and a storage room for supplies, so it isn't cheap. Also, if Jason went into this business, he would need an expensive business operator's license from the city. The downtown vendor charges only $1 for a bag of popcorn, so Jason would have to sell a lot of popcorn to recoup the high price of the wagon and the license, $8,000 and $4,000 respectively. His variable costs are $0.04 per bag.

Is this a viable business idea or not? What are the risks and the potential returns of this business? Is this a better path than taking a McJob, as many of Jason's friends have done? In this chapter we'll look at some of these issues.

Source: Jason's popcorn venture is based on actual events. The entrepreneur's name has been changed and approximate numbers have been used, because data about this private company are confidential.

Chapter Overview

In this chapter we investigate how fixed costs affect the volatility of a firm's operating and net income. We see how fixed operating costs create *operating leverage*, which magnifies the effect of sales changes on operating income. We also examine how fixed financial costs create *financial leverage*, which magnifies the effect of changes in operating income on net income. Then we analyze the risk and return of leveraged buyouts (LBOs). Finally, we see how changes in a firm's capital structure affect the firm's overall value.

Learning Objectives

After reading this chapter, you should be able to:

1. Define capital structure.
2. Explain operating, financial, and combined leverage effects and the resulting risks.
3. Find the breakeven level of sales for a firm.
4. Describe the risks and returns of a leveraged buyout.
5. Explain how changes in capital structure affect a firm's value.

Capital Structure

Capital structure is the mixture of funding sources (debt, preferred stock, or common stock) that a firm uses to finance its assets. A central question in finance is what blend of these financing sources is best for the firm. That is, how much of a firm's assets should be financed by borrowing? How much should be financed by preferred stockholders? How much should be financed by the common stockholders? The question is important because each of these financing sources has a different cost, as you learned in Chapter 9, and each of them has a different degree of risk. Therefore, the choice of financing directly affects a firm's weighted average cost of capital and the degree of riskiness in the firm.

The amount of debt that a firm uses to finance its assets creates **leverage**. A firm with a lot of debt in its capital structure is said to be highly levered. A firm with no debt is said to be unlevered. In physics, the term *leverage* describes how a relatively small force input can be magnified to create a larger force output. For

example, if a farmer wants to move a large boulder in a field, he can wedge a long board (a lever) between the large boulder and a small rock (a fulcrum), which gives him enough leverage to push down on the end of the long board and easily move the boulder.

The power of leverage can also be harnessed in a financial setting. Its magnifying power can help or hurt a business. A firm that has leverage will earn or lose more than it would without leverage. In the sections that follow, we investigate specific types of leverage and the risks associated with each type.

Operating Leverage

Operating leverage refers to the phenomenon whereby a small change in sales triggers a relatively large change in operating income (or earnings before interest and taxes, also known as EBIT). Operating leverage occurs because of fixed costs in the operations of the firm. A firm with fixed costs in the production process will see its EBIT rise by a larger percentage than sales when unit sales are increasing. If unit sales drop, however, the firm's EBIT will decrease by a greater percentage than its sales.

Table 13-1 illustrates the operating leverage effect for a firm in which all production costs, a total of $5,000, are fixed. Observe how the presence of the fixed costs causes a 10 percent change in sales to produce a 20 percent change in operating income.

Calculating the Degree of Operating Leverage The degree of operating leverage, or DOL, measures the magnitude of the operating leverage effect. The **degree of operating leverage** is the percentage change in earnings before interest and taxes (%ΔEBIT) divided by the percentage change in sales (%ΔSales):

$$\text{Degree of Operating Leverage (DOL)}$$

$$\text{DOL} = \frac{\%\Delta\,\text{EBIT}}{\%\Delta\,\text{Sales}} \qquad (13\text{-}1)$$

where: %Δ EBIT = Percentage change in earnings before interest and taxes

%Δ Sales = Percentage change in sales

According to Equation 13-1, the DOL for the firm in Table 13-1 is

$$\text{DOL} = \frac{20\%}{10\%}$$

$$= 2.0$$

Table 13-1 The Operating Leverage Effect—Fixed Costs Only

	Period 1	Period 2	Percent Change
Sales	$10,000	$11,000	10%
Fixed Costs	– 5,000	– 5,000	
Operating Income	$ 5,000	$ 6,000	20%

We see that, for a firm with a 10 percent change in sales and a 20 percent change in EBIT, the DOL is 2.0. A DOL greater than 1 shows that the firm has operating leverage. That is, when sales change by some percentage, EBIT will change by a greater percentage.

The Effect of Fixed Costs on DOL Table 13-2 shows the projected base-year and second-year income statement for Jason's Popcorn Wagon. The income statement allows us to analyze Jason's operating leverage. (Note that Table 13-2 divides the operating expenses into two categories, fixed and variable.) We see that sales and operating expenses are likely to change in the second and subsequent years. We also see the predicted impact on EBIT, given the sales forecast.

We see from Table 13-2 that Jason's percentage change in sales is 10 percent, and his percentage change in EBIT (or operating income) is 17.1 percent. We use Equation 13-1 to find Jason's DOL, as follows:

$$\text{DOL} = \frac{\%\Delta \text{EBIT}}{\%\Delta \text{Sales}}$$

$$= \frac{(19{,}680 - 16{,}800)/16{,}800}{(33{,}000 - 30{,}000)/30{,}000}$$

$$= \frac{.171}{.10}$$

$$= 1.71$$

Our DOL calculations indicate that if Jason's Popcorn Wagon business sales increase by 10 percent from the base year to the next year, EBIT will increase by 17.1 percent. This larger percentage increase in EBIT is caused by the company's fixed operating costs. No matter how much popcorn Jason produces and sells, his wagon and license costs stay the same. The fixed costs cause the EBIT to increase faster than sales. If sales decrease, the fixed costs must still be paid. As a result, the fixed costs cause EBIT to drop by a greater percentage than sales.

Table 13-2 Jason's Popcorn Wagon Projected Income Statement (Fixed Costs Are $12,000, Variable Costs Are $0.04 per Unit, and Price per Unit is $1.00)

	Base Year	Year 2	
Sales	$30,000	$33,000	$\%\Delta = \frac{33{,}000 - 30{,}000}{30{,}000} = .10$, or 10%
– VC	– 1,200	– 1,320	
– FC	– 12,000	– 12,000	
= EBIT	= $16,800	= $19,680	$\%\Delta = \frac{19{,}680 - 16{,}800}{16{,}800} = .171$, or 17.1%

The Alternate Method of Calculating DOL Instead of using Equation 13-1, we may also find the DOL by using only numbers found in the base-year income statement. Subtract total variable costs from sales, divide that number by sales minus total variable costs minus fixed costs, and solve for DOL. The formula for the alternate method of finding DOL, Equation 13-2, follows:

Degree of Operating Leverage (DOL) (alternate)

$$\text{DOL} = \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}} \tag{13-2}$$

where: VC = Total variable costs

FC = Total fixed costs

From Table 13-2, we know that in the base year, Jason's Popcorn Wagon has sales of $30,000, variable costs of $1,200, and fixed costs of $12,000. Using the alternate formula, we find that Jason has the following DOL:

$$\begin{aligned}\text{DOL} &= \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}} \\ &= \frac{30,000 - 1,200}{30,000 - 1,200 - 12,000} \\ &= \frac{28,800}{16,800} \\ &= 1.71\end{aligned}$$

We find a DOL of 1.71, just as we did with Equation 13-1. How did this happen? The alternate formula, Equation 13-2, uses only numbers from the base year income statement, whereas Equation 13-1 requires information from the base year and year 2.[1] Why use two different ways to calculate DOL when they both give the same answer? The answer is that each method reveals different information about operating leverage.

The percentage change version of the DOL formula, Equation 13-1, shows the effect of the leverage—sales change by a certain percentage, triggering a greater percentage change in operating income if the DOL is greater than 1. The percentage change in operating income, then, is the product of the percentage change in sales and this degree of operating leverage.

The alternate DOL formula, Equation 13-2, shows that fixed costs cause the leveraging effect. Whenever fixed costs are greater than 0, DOL is greater than 1, indicating a leverage effect (the percentage change in EBIT is greater than the percentage change in sales). The larger the amount of fixed costs, the greater the leveraging effect.

Taken together, the two formulas demonstrate that leverage has the effect of triggering a greater percentage change in operating income when a percentage change in sales occurs and that fixed costs cause operating leverage. Equation 13-3 shows how changes in sales and DOL combine to determine the change in EBIT.

Percentage Change in EBIT

$$\%\Delta \text{ EBIT} = \%\Delta \text{ Sales} \times \text{DOL} \tag{13-3}$$

[1]Equations 13-1 and 13-2 give the same numeric result when sales price per unit, fixed costs, and variable costs per unit are constant.

where: %Δ Sales = Percentage change in sales

DOL = Degree of operating leverage

The Risk of Operating Leverage As we know from Chapter 7, the risk associated with operating leverage is business risk. Recall that business risk refers to the volatility of operating income. The more uncertainty about what a company's operating income will be, the higher its business risk. Volatility of sales triggers business risk. The presence of fixed costs, shown by the amount of DOL, magnifies business risk. The total degree of business risk that a company faces is a function of both sales volatility and the degree of operating leverage.

Financial Leverage

Fluctuations in sales and the degree of operating leverage determine the fluctuations in operating income (also known as EBIT). Now let's turn our attention to financial leverage. **Financial leverage** is the additional volatility of net income caused by the presence of fixed-cost funds (such as fixed-rate debt) in the firm's capital structure. Interest on fixed-rate debt is a fixed cost because a firm must pay the same amount of interest, no matter what the firm's operating income.

Calculating the Degree of Financial Leverage (DFL) The **degree of financial leverage (DFL)** is the percentage change in net income (%ΔNI) divided by the percentage change in EBIT (%ΔEBIT). The formula for DFL follows:

$$\text{Degree of Financial Leverage (DFL)}$$

$$\text{DFL} = \frac{\%\Delta \text{NI}}{\%\Delta \text{EBIT}} \tag{13-4}$$

where: %Δ NI = Percentage change in net income

%Δ EBIT = Percentage change in earnings before interest and taxes

If net income changes by a greater percentage than EBIT changes, then the DFL will have a value greater than 1, and this indicates a financial leverage effect.[2]

Table 13-3 shows the entire base-year income statement for Jason's Popcorn Wagon and the projections for year 2. Notice that the lower portion of the income statements contains fixed interest expense, so we would expect the presence of financial leverage.

As shown in Table 13-3, the percentage change in EBIT from the base year to year 2 is 17.1 percent, and the percentage change in net income from the base year to year 2 is 18 percent. Jason's degree of financial leverage according to Equation 13-4 follows:

$$\text{DFL} = \frac{\%\Delta \text{NI}}{\%\Delta \text{EBIT}}$$

$$= \frac{.18}{.171}$$

$$= 1.05$$

[2]Note that the degree of financial leverage calculated using Equation 13-4 will be faced by preferred stockholders and common stockholders together. If you were interested in finding the degree of financial leverage faced by common stockholders only, you would modify Equation 13-4 by subtracting preferred dividends from net income.

Table 13-3 Jason's Popcorn Wagon Projected Income Statements

	Base Year	Year 2	
Sales	$30,000	$33,000	$\%\Delta = \frac{33{,}000 - 30{,}000}{30{,}000} = .10$, or 10%
– VC	– 1,200	– 1,320	
– FC	– 12,000	– 12,000	
= EBIT	= $16,800	= $19,800	$\%\Delta = \frac{19{,}680 - 16{,}800}{16{,}800} = .171$, or 17.1%
– Int	– 800	– 800	
= EBT	= 16,000	= 18,880	
– Tax(15%)	– 2,400	– 2,832	
= NI	= 13,600	= 16,048	$\%\Delta = \frac{16{,}048 - 13{,}600}{13{,}600} = .18$, or 18%

Our calculations show that Jason's Popcorn Wagon business has a degree of financial leverage of 1.05.

Another Method of Calculating Financial Leverage Just as with DOL, there are two ways to compute DFL. Instead of using Equation 13-4, the percentage change in NI divided by the percentage change in EBIT, we could instead calculate the DFL using only numbers found in the base-year income statement. By dividing EBIT by EBIT minus interest expense (Int), we can find DFL. The equation looks like this:

Degree of Financial Leverage (DFL) (alternate)

$$DFL = \frac{EBIT}{EBIT - Int} \tag{13-5}$$

where: EBIT = Earnings before interest and taxes

Int = Interest expense

The base-year income statement numbers in Table 13-3 show that Jason's EBIT is $16,800 and his interest expense is $800. To find the degree of financial leverage, we apply Equation 13-5 as follows:

$$DFL = \frac{EBIT}{EBIT - Int}$$

$$= \frac{16{,}800}{16{,}800 - 800}$$

$$= \frac{16{,}800}{16{,}000}$$

$$= 1.05$$

Equation 13-5 yields the same DFL for Jason's business as Equation 13-4.[3] Both formulas are important because they give us different but equally important insights about financial leverage. Equation 13-4 shows the effect of financial leverage—net income (NI) will vary by a larger percentage than operating income (EBIT). Equation 13-5 pinpoints the source of financial leverage—fixed interest expense. The degree of financial leverage, DFL, will be greater than 1 if interest expense (I) is greater than 0. In sum, interest expense magnifies the volatility of NI as operating income changes.

How Interest Expense Affects Financial Leverage To illustrate the financial leverage effect, suppose that to help start his business, Jason borrowed $10,000 from a bank at an annual interest rate of 8 percent. This 8 percent annual interest rate means that Jason will have to pay $800 ($10,000 × .08) in interest each year on the loan. The interest payments must be made, no matter how much operating income Jason's business generates. In addition to Jason's fixed operating costs, he also has fixed financial costs (the interest payments on the loan) of $800.

The fixed financial costs magnify the effect of a change in operating income on net income. For instance, even if Jason's business does well, the bank interest payments do not increase, even though he could afford to pay more. If Jason's business does poorly, however, he cannot force the bank to accept less interest simply because he cannot afford the payments.

The Risk of Financial Leverage The presence of debt in a company's capital structure and the accompanying interest cost create extra risk for a firm. As we know from Chapter 7, the extra volatility in NI caused by fixed interest expense is financial risk. The financial risk of the firm compounds the effect of business risk and magnifies the volatility of net income. Just as fixed operating expenses increase the volatility of operating income and business risk, so too fixed financial expenses increase the volatility of NI and increase financial risk. This is shown in Equation 13-6.

Percentage Change in Net Income

$$\%\Delta \text{ NI} = \%\Delta \text{ EBIT} \times \text{DFL} \tag{13-6}$$

where: %Δ EBIT = Percentage change in earnings before interest and taxes

DFL = Degree of financial leverage

Now we explore the combined effect of operating and financial leverage next.

Combined Leverage

The combined effect of operating leverage and financial leverage is known as **combined leverage.** Combined leverage occurs when net income changes by a larger percentage than sales, which occurs if there are any fixed operating or financial costs. The following combined leverage formula solves for the net income change due to sales changes that occur when fixed operating and financial costs are present.

[3]Equations 13-4 and 13-5 give the same DFL value only if the fixed financial costs (interest expense) and the tax rate are constant.

The **degree of combined leverage (DCL)** is the percentage change in net income (%Δ NI) divided by the percentage change in sales (%Δ Sales), as shown in Equation 13-7:

$$\text{Degree of Combined Leverage (DCL)}$$

$$\text{DFL} = \frac{\%\Delta \text{ NI}}{\%\Delta \text{ Sales}} \tag{13-7}$$

where: %Δ NI = Percentage change in net income

%Δ Sales = Percentage change in sales

The alternate DCL formula follows:

$$\text{Degree of Combined Leverage (DCL) (alternate 1)}$$

$$\text{DFL} = \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC} - \text{Int}} \tag{13-8}$$

where: VC = Total variable costs

FC = Total fixed costs

Int = Interest expense

We can also calculate the degree of combined leverage (DCL) a third way: multiplying the degree of operating leverage (DOL) by the degree of financial leverage (DFL). The third DCL formula is shown in Equation 13-9.

$$\text{Degree of Combined Leverage (DCL) (alternate 2)}$$

$$\text{DCL} = \text{DOL} \times \text{DFL} \tag{13-9}$$

where: DOL = Degree of operating leverage

DFL = Degree of financial leverage

Equation 13-10 shows the combined effect of DOL and DFL on net income (NI).

$$\text{Percentage Change in Net Income (NI)}$$

$$\%\Delta \text{ NI} = \%\Delta \text{ Sales} \times \text{DOL} \times \text{DFL} \tag{13-10}$$

where: %Δ Sales = Percentage change in sales

DOL = Degree of operating leverage

DFL = Degree of financial leverage

Equation 13-10 shows how the change in net income is determined by the change in sales and the compounding effects of operating and financial leverage.

Fixed Costs and Combined Leverage Fixed operating costs create operating leverage, fixed financial costs create financial leverage, and these two types of leverage together form combined leverage. If fixed operating costs (FC) and fixed interest costs (Int) were

both zero, there would be no leverage effect. The percentage change in net income (NI) would be the same as the percentage change in sales. If either, or both, fixed operating costs and fixed financial costs exceed zero, a leverage effect will occur (DCL > 1).

Firms that have high operating leverage need to be careful about how much debt they pile onto their balance sheets, and the accompanying interest costs they incur, because of combined leverage effects. Remember that for Jason's Popcorn Wagon, the degree of operating leverage (DOL) was 1.71 and the degree of financial leverage was 1.05. The degree of combined leverage for Jason's business according to Equation 13-8 is 1.80 (1.71 × 1.05 = 1.80 rounded to two decimal places). Jason is quite confident that his sales will be high enough so that this high leverage will not be a problem. If the sales outlook were questionable, though, the combined leverage effect could magnify poor sales results.

Leverage is helpful when sales increase (positive percentage changes). Magnifying this positive change benefits the firm. However, leverage is harmful when sales decrease because it magnifies the negative change. Because future sales for most companies are uncertain, most companies view leverage with mixed feelings.

Interactive Module

Go to the Interactive Spreadsheets you downloaded for chapter 13. Follow the instructions there. Observe how fixed operating costs and fixed financial costs lead to operating leverage and financial leverage, respectively.

Breakeven Analysis and Leverage

Investments in projects may change a firm's fixed operating and financing costs, thereby affecting firm value. Fixed costs may affect firm value because of *leverage effects* and the resulting risk from those leverage effects.

To understand a firm's potential for risk and return, then, financial managers must understand two types of leverage effects: operating leverage and financial leverage.

Breakeven analysis is a key to understanding *operating leverage*. In breakeven analysis we examine fixed and variable operating costs. **Fixed costs** are those costs that do not vary with the company's level of production. **Variable costs** are those costs that change as the company's production levels change.

In breakeven analysis, the **sales breakeven point** is the level of sales that a firm must reach to cover its operating costs. Put another way, it is the point at which the operating income (earnings before interest and taxes) equals zero.

A company with high fixed operating costs must generate high sales revenue to reach the sales breakeven point. A company with low fixed operating costs requires relatively low sales revenue to reach its sales breakeven point.

We usually observe a high/low trade-off in breakeven analysis. Firms with high fixed operating costs tend to have low variable costs, and vice versa. A company that automates a factory, for instance, commits to significant fixed costs—the expensive equipment. But the company's variable labor costs are likely to be low at a highly automated plant that operates with relatively few employees. In contrast, a company that produces handmade pottery with little overhead and hires hourly workers as needed, is likely to have low fixed costs but high variable costs.[4]

To demonstrate the high/low trade-off, we gather data for a sales breakeven chart for two firms. The first firm has high fixed and low variable costs. The second firm has low fixed and high variable costs.

[4]Labor costs can be either fixed or variable. If workers are guaranteed pay for a certain minimum number of hours per week, as might be called for in a union contract, the labor costs associated with this minimum guaranteed pay would be fixed costs. The costs associated with hourly worker pay with no guaranteed minimum are variable.

Constructing a Sales Breakeven Chart

A breakeven chart shows graphically how fixed costs, variable costs, and sales revenue interact. Analysts construct the chart by plotting sales revenue and costs at various unit sales levels on a graph. To illustrate, let's construct the breakeven chart for Jason's Popcorn Wagon, featured in the opening of the chapter.

The first step in constructing the breakeven chart is to find the breakeven point for the business. Let's look at some of the numbers for Jason's business and calculate the level of sales Jason must achieve to break even. Recall that at the breakeven point, operating income equals zero. If sales are below the breakeven point, Jason suffers an operating loss. If sales are above the breakeven point, Jason enjoys an operating profit. (Interest and taxes, subtracted after finding operating income, will be discussed in the last section of the chapter.)

Jason wants to know that his business venture has the potential for a positive operating profit, so he is keenly interested in finding his breakeven point. To find this point, we need to know how many bags of popcorn he must sell before the sales revenue contributed by each bag sold just covers his fixed and variable operating costs. The relevant sales breakeven figures for Jason's proposed business are shown in Table 13-4.

The numbers in Table 13-4 show that Jason's fixed costs are high compared with his sales price of $1 per bag of popcorn. The fixed costs include the $8,000 annual rental fee for the wagon and the $4,000 annual license fee. Jason must pay these costs no matter how much popcorn he produces and sells.

In contrast to the high fixed operating costs, Jason's variable operating costs per unit are a tiny fraction of his sales price of $1 per unit. The bag, oil, salt, and popcorn that help produce one bag of popcorn cost a total of $0.04. Each bag of popcorn that is sold, then, contributes $0.96 to cover the fixed costs, and ultimately the profit of the business ($1.00 – $0.04 = $0.96). The sales price per unit minus the variable cost per unit, $.96 in this case, is the contribution margin.

From the numbers presented in Table 13-4, we can calculate the breakeven level of sales for Jason's business. We find the level of sales needed to reach the operating income breakeven point by applying the following formula:

Table 13-4 Jason's Relevant Figures for Breakeven Analysis

Fixed Costs:	
Wagon (annual rental)	$ 8,000
City License (annual fee)	$ 4,000
Total	$12,000
Variable Costs per Unit:	
One Paper Bag	$ 0.020
Oil	$ 0.005
Salt	$ 0.003
Popcorn	$ 0.012
Total	$ 0.040
Sales Price per Unit:	$ 1.00

The Breakeven Point in Unit Sales, $Q_{b.e.}$

$$Q_{b.e.} = \frac{FC}{p - vc} \tag{13-11}$$

where: $Q_{b.e.}$ = Quantity unit sales breakeven level
FC = Total fixed costs
p = Sales price per unit
vc = Variable cost per unit

For Jason's business, the total fixed costs are $12,000, the price per unit is $1, and the variable cost per unit is $.04. According to Equation 13-11, Jason's popcorn business has the following sales breakeven point:

$$Q_{b.e.} = \frac{\$12,000}{\$1.00 - \$.04}$$

$$= \frac{\$12,000}{\$.96}$$

$$= 12,500$$

We find that Jason's sales breakeven point with $12,000 in fixed costs, $.04 per unit in variable costs, and a $1 per bag sales price, is 12,500 units. At $1 per bag, this is $12,500 in sales to reach the breakeven point.

Now that we know Jason's sales breakeven point, we need revenue and cost information to construct the breakeven chart.

Revenue Data At any given level of unit sales, Jason's total sales revenue can be found using Equation 13-12:

Total Revenue (TR)

$$TR = p \times Q \tag{13-12}$$

where: p = Sales price per unit
Q = Unit sales (Quantity sold)

Table 13-5 shows how to calculate Jason's sales revenues at different sales levels. For instance, we see that if Jason sells 5,000 bags of popcorn at the price of $1 per bag, his total revenue will be 5,000 × $1.00 = $5,000. If Jason sells 10,000 bags, his total revenue will be $10,000.

Cost Data By definition, Jason's fixed costs will remain $12,000, regardless of the level of unit production and sales. His variable costs, however, increase by $0.04 for each unit sold. Jason's total costs for any given level of unit production and sales can be found using Equation 13-13 as follows:

Total Costs (TC)

$$TC = FC + (vc \times Q) \tag{13-13}$$

Table 13-5 Sales Revenues at Different Unit Sales Levels

Unit Sales (Q)	x	Price (P)	=	Total Revenue (TR)
0	x	$1	=	$ 0
5,000	x	$1	=	$ 5,000
10,000	x	$1	=	$10,000
15,000	x	$1	=	$15,000
20,000	x	$1	=	$20,000
25,000	x	$1	=	$25,000
30,000	x	$1	=	$30,000

where: FC = Fixed costs

vc = Variable costs per unit

Q = Units produced

Table 13-6 demonstrates how we use Equation 13-13 to calculate Jason's total costs for different production and sales levels. For instance, we see that if Jason sells 5,000 bags of popcorn at a variable cost of $0.04 per bag and fixed costs of $12,000, his total cost will be $12,200. At 10,000 bags, his total cost will be $12,400. We assume the number of units produced equals the number of units sold.

Plotting Data on the Breakeven Chart Jason's breakeven chart is shown in Figure 13-1. The chart is constructed with units produced and sold (Q) on the horizontal axis and cost and revenue dollars on the vertical axis. Total revenues from Table 13-5 are shown on the TR line, and total costs from Table 13-6 are shown on the TC line.

We see from the chart that to break even, Jason has to sell $12,500 worth of popcorn at $1 per bag—a quantity of 12,500 bags.

Table 13-6 Jason's Total Costs for Different Sales Levels

Fixed Costs (FC)	+	(Variable Cost/Unit (vc)	x	Units Produced (Q)	=	Total Cost (TC)
$12,000	+	($.04	x	0)	=	$12,000
$12,000	+	($.04	x	5,000)	=	$12,200
$12,000	+	($.04	x	10,000)	=	$12,400
$12,000	+	($.04	x	15,000)	=	$12,600
$12,000	+	($.04	x	20,000)	=	$12,800
$12,000	+	($.04	x	25,000)	=	$13,000
$12,000	+	($.04	x	30,000)	=	$13,200

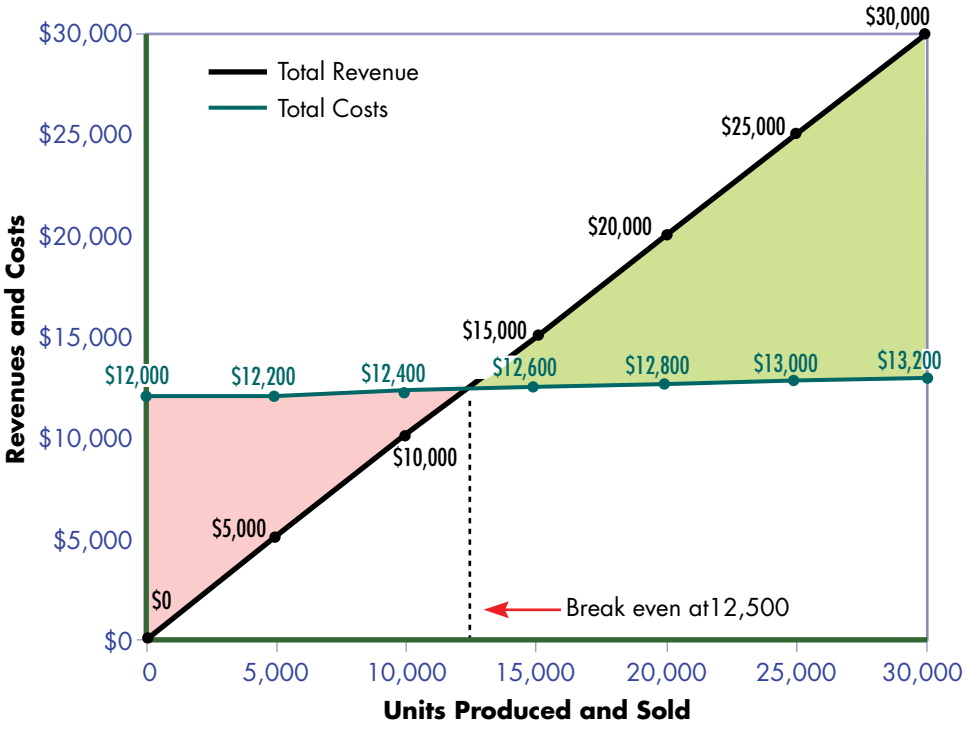

Figure 13-1 Breakeven Chart for Jason's Popcorn Wagon

Applying Breakeven Analysis

Although 12,500 bags of popcorn may seem like a lot of sales just to break even, Jason has watched another vendor downtown sell on average 500 bags of popcorn a day. Jason plans to sell for three months during the summer, four weeks a month, five days a week. He estimates that he could sell 30,000 bags of popcorn (500 bags × 3 months × 4 weeks × 5 days) during the summer. At this sales level, Jason expects $30,000 in gross sales revenue at $1 per bag and $16,800 in operating income [$30,000 total revenue – $12,000 fixed costs – ($30,000 × .04 variable costs) = $16,800 operating income]. Not a bad summer job income.

How is it possible to make so much money selling popcorn? Note how once Jason passes the breakeven point in sales, each additional $1 bag of popcorn he sells generates $0.96 of operating profit. The $0.04 in variable costs incurred in the production of that bag of popcorn represents a small part of the $1 in revenue generated. Operating profit rises rapidly as sales climb above the breakeven point of 12,500 units, as shown by Figure 13-1. Were Jason's sales potential not so promising, however, his risk of loss (negative operating income) would be a greater concern. The red area of the graph in Figure 13-1 shows Jason's loss potential.

The breakeven chart allows Jason to see the different sales scenarios to understand his profit and loss potential. Because the total revenue line in Figure 13-1 is much steeper than the total cost line (because the sales price per unit is much greater than the variable cost per unit) the profit potential is great. Because of the high fixed costs, however, the loss potential is great, too. What happens depends on how much popcorn Jason can sell.

To illustrate what happens with a low breakeven business, let's construct a breakeven chart for Carey, another college student, who wants to sell hotplate mini-cookbooks (only five pages long) to college students.[5]

Because Carey plans to operate from her apartment and use her own recipes for the mini-cookbook, her only fixed cost would be a $1,000 printer's design fee. Her variable costs consist of her paper printing costs at $0.60 per unit. Carey plans to sell her cookbook for $1 per unit.

This is a low-risk business. The design fee is modest and there are no other fixed costs. The contribution margin is $0.40 ($1.00 sales price – $0.60 variable cost per unit). We can find Carey's breakeven point using Equation 13-11:

$$Q_{b.e.} = \frac{FC}{p - vc}$$

$$= \frac{\$1,000}{\$1 - \$.60}$$

$$= \frac{\$1,000}{\$.40}$$

$$= 2,500$$

We find that Carey's breakeven point is 2,500 units. Carey figures she can sell to friends in the dorm. Beyond that, however, the sales potential is uncertain. She may or may not reach the breakeven point.

To find Carey's breakeven point, we find her total revenue and total costs at different sales levels and plot them on a breakeven chart (see Figure 13-2).

Note how small the loss potential is for Carey's business, as shown in the red area in Figure 13-2, compared with Jason's loss potential, shown in the red area in Figure 13-1. Carey's loss potential is small because her breakeven level of sales ($0 operating income) is 2,500 units, compared with Jason's 12,500 unit breakeven point. Even if she sold nothing, Carey would lose only the $1,000 in fixed costs that she had to pay (compared with Jason's $12,000). Table 13-7 shows the profit and loss potential for Jason and Carey.

The risk of Jason's business is also evident when we look at sales of 15,000 units for each business. Jason has a profit of only $2,400, whereas Carey would earn a profit of $5,000; at 30,000 units sold, however, Jason earns a profit of $16,800 and Carey earns only $11,000, as shown in Table 13-7. Jason's profits are much more dependent on selling a large number of units than Carey's.

Now compare the profit potential for the two proposed businesses. Jason has the potential to make much more profit (operating income) than Carey. At a sales level of 30,000, Table 13-7 shows Jason makes $16,800, whereas Carey would make only $11,000. Even though Jason's business has more risk—he stands to lose much more if sales don't go well—he has the potential for greater returns.

Whether the high fixed cost and low variable cost per unit business (like Jason's) is better than the low fixed cost and high variable cost per unit business (like Carey's) depends on two factors: how many units you think you can sell and how much tolerance

[5]Believe it or not, Carey's business is also inspired by a true story. Oliver Stone would be proud.

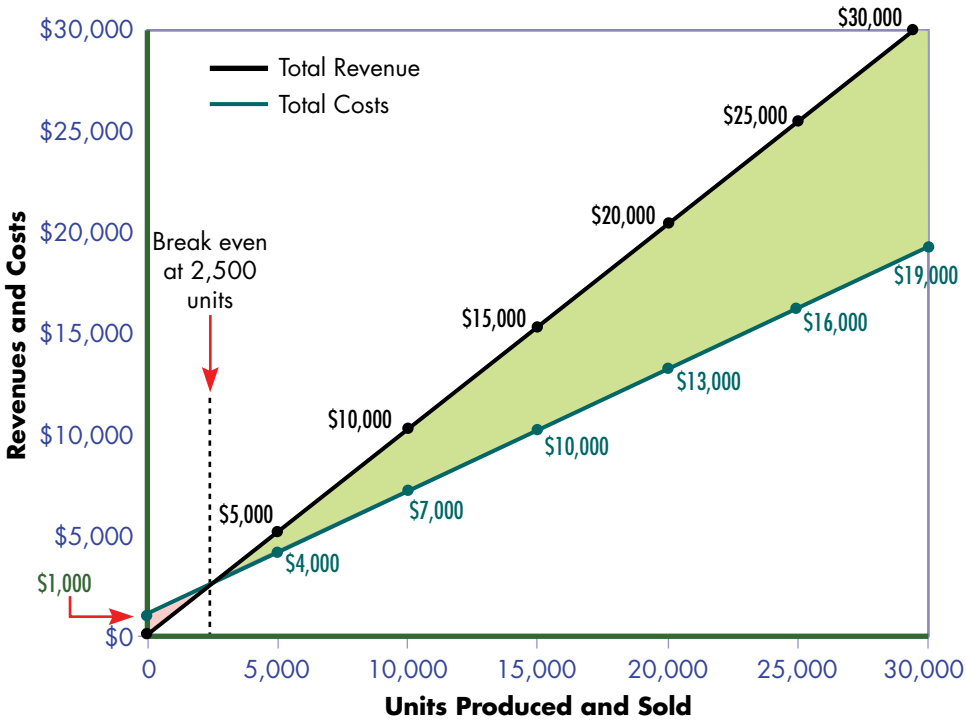

Figure 13-2 Breakeven Chart for Carey's Mini-Cookbooks

Table 13-7 Jason's and Carey's Profit and Loss Potential

Units Produced and Sold	Jason			Carey		
	$Total Costs	$Total Revenue	$Operating Income	$Total Costs	$Total Revenue	$Operating Income
0	12,000	0	–12,000	1,000	0	–1,000
5,000	12,200	5,000	–7,200	4,000	5,000	1,000
10,000	12,400	10,000	–2,400	7,000	10,000	3,000
15,000	12,600	15,000	2,400	10,000	15,000	5,000
20,000	12,800	20,000	7,200	13,000	20,000	7,000
25,000	13,000	25,000	12,000	16,000	25,000	9,000
30,000	13,200	30,000	16,800	19,000	30,000	11,000
35,000	13,400	35,000	21,600	22,000	35,000	13,000
40,000	13,600	40,000	26,400	25,000	40,000	15,000

you have for risk. High fixed costs and low variable costs per unit mean high profit potential and high loss potential, as in the case of Jason's proposed business. Conversely, low fixed costs and high variable costs per unit mean low profit potential and low loss potential, as in the case of Carey's proposed business.

Take Note

Long-distance telephone and cable companies are examples of firms with high fixed costs and low variable costs per unit. A consulting firm would be an example of a firm with low fixed costs and high variable costs.

LBOs

Many publicly owned corporations have been bought out by a small group of investors, including top management of the firm, using a large amount of borrowed money. Such a purchase is called a *leveraged buyout*, or LBO. The leverage referred to is financial leverage.

In an LBO, investment banking firms work to identify attractive target companies. These investment banking firms solicit investors to acquire the target. To take over the target, the purchasing group raises cash, mostly borrowed, to purchase the common stock shares from the general public. The stock purchase converts the publicly owned corporation to a privately owned one. The investment banking firm would collect fees for its advice and for underwriting the bond issue that helped raise the additional debt capital.

Because of the dramatic increase in financial leverage, some LBOs have worked out well for investors and others have been disasters. For instance, Kohlberg, Kravis, & Roberts made a 50 percent annual rate of return on its $1.34 billion investment after the Beatrice Company LBO. In contrast, the 1986 $1.4 billion LBO of Revco Drug Stores didn't fare as well. Two years later the company filed for bankruptcy when it was unable to generate enough cash flow to pay the interest and principal due on its bonds. Other companies purchased through LBOs include Toys R Us, Neiman Marcus, Borg-Warner, Montgomery Ward, Safeway, Southland, and RJR Nabisco. Bain Capital, Blackstone Group, Carlyle Group and Kohlberg Kravis Roberts & Co. were reported in May of 2006 to have joined forces with Grupo Televisa SA to launch an LBO of Univision Communications Inc, the Spanish language television company. This target company is known for its soccer announcer who yells "goooooooooooooooooooal" after a score.

When a company with a normal debt load goes through an LBO, investors holding the company's bonds issued before the LBO are often hurt. The surge in the company's debt results in more financial risk. With higher risk, the market requires a higher rate of return, so the bonds issued before the LBO will see their market interest rates rise—and their market prices fall—after the company announces an LBO.

To illustrate the effects on bondholders, consider the 2005 LBO of SunGard Data Systems. Table 13-8 shows how holders of SunGard's bonds suddenly had a claim on a much riskier company.

The risk of an LBO is large because of financial leverage effects. As the Beatrice and Revlon examples indicate, potential returns from an LBO may be large positive or negative values because of financial leverage effects. Bondholders may suddenly see the value of their bonds drop precipitously after an LBO announcement. In Chapter 14, we discuss how bondholders can protect themselves against this risk.

Now that we have analyzed how fixed operating and financial costs can create leverage effects and risk, we will consider the optimal capital structure for a firm.

Capital Structure Theory

Every time a company borrows, it increases its financial leverage and financial risk. New equity financing decreases financial leverage and risk. Changes in financial leverage, we have seen, bring the potential for good and bad results. How then do financial managers decide on the right balance of debt and equity? Financial managers analyze many factors, including the tax effects of interest payments and how the comparative costs of debt and equity affect firm value.

Table 13-8 Effect of a Leveraged Buyout on SunGard Data Systems

	Before the Buyout (2004)	After the Buyout (2005)
Total Assets	$5,195	$14,587
Total Debt	554	7,429
Stockholder's Equity	3,252	3,572
Debt to Assets Ratio 11%		51%
Price of Company's Bonds Maturing in 2014	$980	$840
S&P Bond Rating	BBB+	B+

Source: SunGard Data Systems SEC Form 10-K filed March 13, 2006, and "LBOs May Spoil The Corporate-Bond Party" by Mark Whitehouse, Staff Reporter of *The Wall Street Journal*, August 1, 2005 (accessed online at .wsj.com, June 14, 2006)

Tax Deductibility of Interest

Debt in a firm's capital structure can be beneficial. First, debt creates the potential for leveraged increases in net income (NI) when operating income (EBIT) is rising. Second, debt gives the company a tax deduction for the interest that is paid on the debt. In contrast to debt, an issue of common stock to raise equity funds results in no tax break. In short, interest paid on business debt is tax deductible, but dividends paid to common stockholders are not. The tax laws, therefore, give companies an incentive to use debt in their capital structures.

Although the tax deductibility of interest payments on debt is a benefit, debt has costs, too. We know that the financial risk of the firm increases as debt increases. As financial risk increases, including an increasing risk of bankruptcy, a company will incur costs to deal with this risk. For example, suppliers may refuse to extend trade credit to the company, and lawyers' fees may drain funds that could go to either bondholders or common stock investors.

Modigliani and Miller

How does a company balance the costs and benefits of debt? In 1958, Franco Modigliani and Merton Miller wrote a seminal paper that has influenced capital structure discussion ever since. Modigliani and Miller (known in economics and finance circles as M&M) concluded that when interest payments are tax deductible to a firm, a capital structure of all debt is optimal.

In reaching this conclusion, M&M assumed the following:

1. There were no transaction costs.
2. Purchasers of a company's bonds or common stock paid no income tax.
3. Corporations and investors can borrow at the same rate of interest.
4. Investors and management have the same information about the firm.
5. Debt the firm issues is riskless.
6. Operating income is not affected by the use of debt.

In such an environment, M&M showed that the tax benefits to the firm from issuing debt were so beneficial that the benefits allowed the company to increase its value by issuing more and more debt. Given the assumptions, a 100 percent debt capital structure is optimal.

The assumptions, of course, do not exist in the real world. Companies don't seek a 100 percent debt capital structure, suggesting that capital structure is not optimal. In the real world, capital structures vary widely.

Toward an Optimal Capital Structure

Firms seek to balance the costs and benefits of debt to reach an optimal mix that maximizes the value of the firm. Figure 13-3 shows the component costs and weighted cost of capital according to the view of most financial managers. Given the way suppliers of capital react in the real world, many financial managers believe this view is more realistic than the M&M model.

Figure 13-3 illustrates what many believe happens to the cost of debt, equity, and the weighted average cost of capital (WACC) as the capital structure of the firm changes. First, the graph shows that debt is cheaper than equity capital. Second, it shows that the weighted average cost of capital equals the cost of equity when the firm has no debt. Third, it shows that at point Z firms minimize the weighted average cost of capital, so at that point the capital structure maximizes the value of the firm. The cost advantage that debt has over equity dominates the increasing risk up to point Z. At this point, the greater risk begins to dominate and causes the weighted average cost of capital to begin to turn upward.

We learned in Chapter 9 how to estimate the costs of debt and equity and weighted average figures. Here we study how capital structure changes may affect the firm's cost of capital and its value.

The Lower Cost of Debt Figure 13-3 shows that debt capital has a lower cost than equity capital. Debt is cheaper than equity for two reasons. As mentioned earlier, interest payments made by a firm are tax deductible and dividend payments made to common stockholders are not. Even without the tax break, however, debt funds are cheaper than equity funds. The required rate of return on a bond is lower than the required rate of return on common stock for a given company because its debt is less risky than its equity to investors. Debt is less risky because bondholders have a claim superior to that of common stockholders on the earnings and assets of the firm.

How Capital Costs Change as Debt Is Added If we examine the WACC line in Figure 13-3, we see that the weighted average cost of capital equals the cost of equity when the firm has no debt. Then, as debt is added, the cost advantage (to the issuing company) of debt over equity makes the weighted average cost of capital decrease, up to a point, as more of the cheaper debt funds and less of the more expensive equity funds are used. The effect of adding debt to capital structure is shown in Figure 13-3 as we move along the horizontal axis from the origin.

The Effect of Risk What causes the WACC to increase, as shown in Figure 13-3, beyond point Z? As the firm moves to a capital structure with higher debt (moves to the right along the horizontal axis of Figure 13-3), the risk of the firm increases. As financial risk

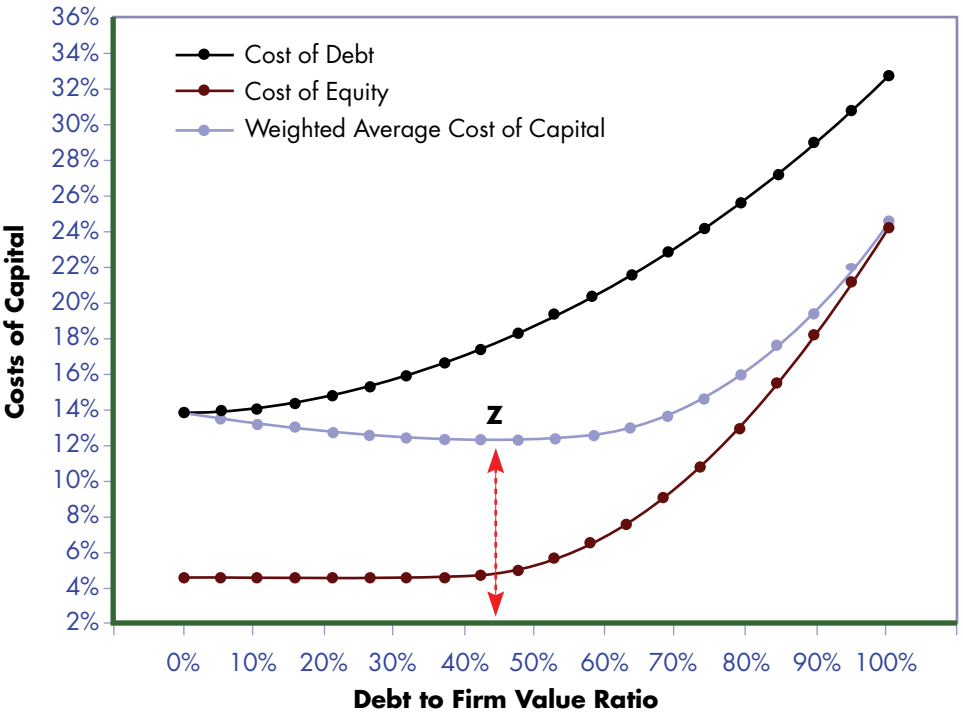

Figure 13-3 Cost of Capital and Capital Structure

rises with additional debt, the required return of both debt and equity investors increases. Notice that the cost of equity curve starts to climb sooner than the cost of debt curve. This is because common stockholders get paid *after* bondholders.

As both the cost of debt and the cost of equity curves turn upward, the curve depicting the weighted average of the cost of debt and the cost of equity eventually turns upward, too. According to the capital structure view depicted in Figure 13-3, if a firm has less debt than the amount at Z, the WACC is higher than it needs to be. Likewise, if a firm has more debt than the amount at Z, the WACC is higher than it needs to be. Only at the capital structure at point Z do firms minimize the weighted average cost of capital. This is the capital structure, then, that maximizes the value of the firm.

Establishing the Optimal Capital Structure in Practice In the real world, it is unlikely that financial managers can determine an exact point for Z where the WACC is minimized. Many financial managers try instead to estimate Z and set a capital structure close to it. Unfortunately, no formula can help estimate point Z. The optimal capital structure for a firm depends on the future prospects of that firm.

For example, say a company has a product in great demand that is protected by a patent with many years to expiration. The company will find that bond and common stock investors are comfortable with a large amount of debt. This firm's Z value will be high. But a firm in a competitive industry, with some quality control problems and soft demand for its product, is in a different position. It will find that bond and common stock investors get nervous (and demand higher returns) when the debt to total value[6] ratio is above even a moderate level. This firm's Z value will be much lower than that of the first firm.

[6]Total value here refers to the total market value of the firm's outstanding debt and equity.

So the answer to the question, "What is the optimal capital structure for a firm?" is, "It depends." With no formula to use to estimate the firm's Z value, management examines the capital structure of similar companies and the future prospects of the firm. Financial managers must balance the costs and benefits of debt and use expertise and experience to develop the capital structure they deem optimal.

What's Next

In this chapter, we examined breakeven analysis, leverage effects, leveraged buyouts, and the effects of changes in a firm's capital structure. In Chapter 14, we look at corporate bonds, preferred stock, and leasing.

Summary

1. Define capital structure.

Capital structure is the mixture of funding sources (debt, preferred stock, or common stock) that a firm uses to finance its assets. A central question in finance is what blend of these financing sources is best for the firm. That is, how much of a firm's assets should be financed by borrowing? How much should be financed by preferred stockholders? How much should be financed by the common stockholders? The question is important because each of these financing sources has a different cost, and each of them has a different degree of risk. Therefore, the choice of financing directly affects a firm's weighted average cost of capital and the degree of riskiness in the firm.

2. Explain operating, financial, and combined leverage effects and the resulting business and financial risks.

Firms with high fixed costs have high operating leverage—that is, a small change in sales triggers a relatively large change in operating income. Firms with low fixed costs have less operating leverage. The effect of low operating leverage is that small changes in sales do not cause large changes in operating income.

Business risk refers to the volatility of a company's operating income. Business risk is triggered by sales volatility and magnified by fixed operating costs.

If a company uses fixed-cost funds (such as fixed interest rate bonds) to raise capital, financial leverage results. With financial leverage, fixed interest costs cause net income to change by a greater percentage than a given percentage change in EBIT.

The presence of financial leverage creates financial risk for a firm—the risk that the firm will not be able to make its interest payments if operating income drops. Financial risk compounds the business risk already present.

The total effect of operating leverage and financial leverage is called combined leverage. The value of the degree of financial leverage is multiplied by the value of the degree of operating leverage to give the degree of combined leverage (DCL). The DCL gives the percentage change in net income for a given percentage change in sales.

3. Find the breakeven level of sales for a firm.

The costs of operating a business can be categorized as fixed or variable. Operating costs that do not vary with the level of production are fixed; operating costs that do vary with the level of production are variable. High fixed costs are usually tied to low variable costs per unit, and low fixed costs are usually tied to high variable costs per unit.

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The breakeven point is the level of sales that results in an operating income of zero. At sales levels above the breakeven point, a firm begins to make a profit. A company with high fixed operating costs must generate high sales revenue to cover its fixed costs (and its variable costs) before reaching the sales breakeven point. Conversely, a firm with low fixed operating costs will break even with a relatively low level of sales revenue.

4. Describe the risks and returns of a leveraged buyout.

LBOs, or leveraged buyouts, occur when publicly owned corporations are bought out by a small group of investors using mostly borrowed funds. The purchase is leveraged because the investors finance it with a large amount of borrowed money. Consequently, when a firm is purchased in an LBO, it is saddled with a large amount of debt in its capital structure and a large amount of financial leverage and financial risk.

5. Explain how changes in capital structure affect a firm's value.

Capital structure theory deals with the mixture of debt, preferred stock, and equity a firm utilizes. Because interest on business loans is a tax-deductible expense, and because lenders demand a lower rate of return than stockholders for a given company (because lending money is not as risky as owning shares), debt capital is cheaper than equity capital. However, the more a company borrows, the more it increases its financial leverage and financial risk. The additional risk causes lenders and stockholders to demand a higher rate of return. Financial managers use capital structure theory to help determine the mix of debt and equity at which the weighted average cost of capital is lowest.

Equations Introduced in This Chapter

Equation 13-1. Degree of Operating Leverage (DOL):

$$\text{DOL} = \frac{\%\Delta\,\text{EBIT}}{\%\Delta\,\text{Sales}}$$

where: %Δ EBIT = Percentage change in earnings before interest and taxes

%Δ Sales = Percentage change in sales

Equation 13-2. Degree of Operating Leverage (DOL) (alternate):

$$\text{DOL} = \frac{\text{Sales} - \text{VC}}{\text{Sales} - \text{VC} - \text{FC}}$$

where: VC = Total variable costs

FC = Total fixed costs

Equation 13-3. Percentage Change in EBIT:

$$\%\Delta\,\text{EBIT} = \%\Delta\,\text{Sales} \times \text{DOL}$$

where: %Δ Sales = Percentage change in sales

DOL = Degree of operating leverage

Equation 13-4. Degree of Financial Leverage (DFL):

$$DFL = \frac{\%\Delta NI}{\%\Delta EBIT}$$

where: %Δ NI = Percentage change in net income

%Δ EBIT = Percentage change in earnings before interest and taxes

Equation 13-5. Degree of Financial Leverage (DFL) (alternate):

$$DFL = \frac{EBIT}{EBIT - Int}$$

where: EBIT = Earnings before interest and taxes

Int = Interest expense

Equation 13-6. Percentage Change in Net Income:

$$\%\Delta NI = \%\Delta EBIT \times DFL$$

where: %Δ EBIT = Percentage change in earnings before interest and taxes

DFL = Degree of financial leverage

Equation 13-7. Degree of Combined Leverage (DCL):

$$DFL = \frac{\%\Delta NI}{\%\Delta Sales}$$

where: %Δ NI = Percentage change in net income

%Δ Sales = Percentage change in sales

Equation 13-8. Degree of Combined Leverage (DCL) (alternate 1):

$$DFL = \frac{Sales - VC}{Sales - VC - FC - Int}$$

where: VC = Total variable costs

FC = Total fixed costs

Int = Interest expense

Equation 13-9. Degree of Combined Leverage (DCL) (alternate 2):

$$DCL = DOL \times DFL$$

where: DOL = Degree of operating leverage
DFL = Degree of financial leverage

Equation 13-10. Percentage Change in Net Income (NI):

$$\%\Delta NI = \%\Delta Sales \times DOL \times DFL$$

where: %Δ Sales = Percentage change in sales
DOL = Degree of operating leverage
DFL = Degree of financial leverage

Equation 13-11. The Breakeven Point in Unit Sales, Qb.e.:

$$Q_{b.e.} = \frac{FC}{p - vc}$$

where: $Q_{b.e.}$ = Quantity unit sales breakeven level
FC = Total fixed costs
p = Sales price per unit
vc = Variable cost per unit

Equation 13-12. Total Revenue, TR:

$$TR = p \times Q$$

where: p = Sales price per unit
Q = Unit sales (Quantity sold)

Equation 13-13. Total Costs, TC:

$$TC = FC = (vc \times Q)$$

where: FC = Fixed costs
vc = Variable costs per unit
Q = Units produced

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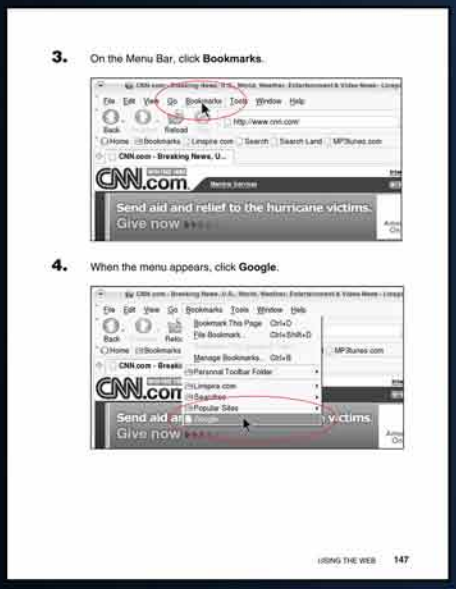

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Self-Test

ST-1. Mr. Marsalis's firm has fixed costs of $40,000, variable costs per unit of $4, and a selling price per unit of $9. What is Mr. Marsalis's breakeven level of sales (in units)?

ST-2. HAL's computer store has sales of $225,000, fixed costs of $40,000, and variable costs of $100,000. Calculate the degree of operating leverage (DOL) for this firm.

ST-3. HAL's computer store has operating income (EBIT) of $85,000 and interest expense of $10,000. Calculate the firm's degree of financial leverage (DFL).

ST-4. Kane Newspapers, Inc., has an after-tax cost of debt of 6 percent. The cost of equity is 14 percent. The firm believes that its optimal capital structure is 30 percent debt and 70 percent equity, and it maintains its capital structure according to these weights. What is the weighted average cost of capital?

ST-5. Johnny Ringo's Western Shoppe expects its sales to increase by 20 percent next year. If this year's sales are $500,000 and the degree of operating leverage (DOL) is 1.4, what is the expected level of operating income (EBIT) for next year if this year's EBIT is $100,000?

ST-6. Marion Pardoo's Bookstore has a degree of operating leverage (DOL) of 1.6 and a degree of financial leverage (DFL) of 1.8. What is the company's degree of combined leverage (DCL)?

Review Questions

1. What is the operating leverage effect and what causes it? What are the potential benefits and negative consequences of high operating leverage?

2. Does high operating leverage always mean high business risk? Explain.

3. What is the financial leverage effect and what causes it? What are the potential benefits and negative consequences of high financial leverage?

4. Give two examples of types of companies likely to have high operating leverage. Find examples other than those cited in the chapter.

5. Give two examples of types of companies that would be best able to handle high debt levels.

6. What is an LBO? What are the risks for the equity investors and what are the potential rewards?

7. If an optimal capital structure exists, what are the reasons that too little debt is as undesirable as too much debt?

Build Your Communication Skills

CS-1. Using publicly available sources, identify four companies having very high debt ratios and four having very low debt ratios. Write a one- to two-page report describing the characteristics of the companies with high debt ratios and those with low debt ratios. Can you identify characteristics that seem to be common to the four high-debt firms? What are characteristics common to the four low-debt firms?

CS-2. Interview the owner of a small business in your community. Ask that person to describe the fixed operating costs and the variable costs of the business. Write a report or give an oral presentation to your class on the nature of the business risk of this firm.

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Problems

13-1. Lilies, a flower shop, has the following data for the most recent fiscal year:

Breakeven Point

Fixed Costs	$2,300/month
Variable Costs (per unit):	
Packets	$ 0.75
Décor	$ 3.00
Misc	$ 2.00
Sales Price	$50.00

a. What is Lilies' breakeven point in sales per month?

b. The owner of Lilies is planning on moving to a new location that will cut fixed costs by 30 percent. The price can be lowered to $45 per unit. What is the new breakeven point in sales (per month)?

13-2. ViSorb sells its deluxe cell phone model for $125, its advanced model for $90, and its basic model for $55. The company has fixed costs of $10,000 per month, and variable costs are $15 per unit sold.

Total Revenue, Total Costs

a. Calculate the total revenue if 30 units of each model are sold.

b. What are the total costs if 30 units of each model are sold?

c. What is the company's total revenue if it sells 10 deluxe models, 15 advanced models, and 35 basic models?

d. What would its total costs be at the sales level in (c)?

13-3. The following is an income statement for Gabotti Enterprises:

Degree of Operating Leverage

	2005	2006
Net Sales	$15,000,000	$25,000,000
Fixed Costs	3,800,000	3,800,000
Variable Costs	1,980,000	3,300,000
Operating Income	$9,220,000	$17,900,000
Interest Expense	1,710,000	1,710,000
EBT	7,510,000	16,190,000
Taxes (30%)	2,253,000	4,857,000
Net Income	$5,257,000	$11,333,000

Calculate Gabotti Enterprises' DOL. Use both methods and compare results.

13-4. From the table in problem 13-3, calculate Gabotti Enterprises' DFL using both methods.

Degree of Financial Leverage

Breakeven Analysis

13-5. Howard Beal Co. manufactures molds for casting aluminum alloy test samples. Fixed costs amount to $20,000 per year. Variable costs for each unit manufactured are $16. Sales price per unit is $28.

a. What is the contribution margin of the product?

b. Calculate the breakeven point in unit sales and dollars.

c. What is the operating profit (loss) if the company manufactures and sells

(i) 1,500 units per year?

(ii) 3,000 units per year?

d. Plot a breakeven chart using the foregoing figures.

Breakeven Analysis

13-6. UBC Company, a competitor of Howard Beal Co. in problem 13-5, has a comparatively labor-intensive process with old equipment. Fixed costs are $10,000 per year and variable costs are $20 per unit. Sales price is the same, $28 per unit.

a. What is the contribution margin of the product?

b. Calculate the breakeven point in unit sales and dollars.

c. What is the operating profit (loss) if the company manufactures and sells

(i) 1,500 units per year?

(ii) 3,000 units per year?

d. Plot a breakeven chart using the foregoing figures.

e. Comment on the profit and loss potential of UBC Company compared with Howard Beal Co.

Operating Leverage

13-7. Use the same data given in problem 13-5 (fixed cost = $20,000 per year, variable cost = $16 per unit, and sales price = $28 per unit) for Howard Beal Co. The company sold 3,000 units in 2006 and expects to sell 3,300 units in 2007. Fixed costs, variable costs per unit, and sales price per unit are assumed to remain the same in 2006 and 2007.

a. Calculate the percentage change in operating income and compare it with the percentage change in sales.

b. Comment on the operating leverage effect.

c. Calculate the degree of operating leverage using

(i) data for 2006 and 2007

(ii) data for 2006 only

d. Explain what the results obtained in (c) tell us.

Financial Leverage

13-8. Use the same data given in problems 13-5 and 13-7 (fixed cost = $20,000 per year, variable cost per unit = $16, sales price per unit = $28, 2006 sales = 3,000 units, and expected 2007 sales = 3,300 units) for Howard Beal Co. Fixed costs, variable costs per unit, and sales price per unit are assumed to remain the same in 2006 and 2007. The company has an interest expense of $2,000 per year. Applicable income tax rate is 30 percent.

a. Calculate the percentage change in net income and compare it with the percentage change in operating income (EBIT).

b. Comment on the financial leverage effect.

c. Calculate the degree of financial leverage using

(i) data for 2006 and 2007

(ii) data for 2006 only

d. Explain what the results obtained in (c) tell us about financial leverage.

13-9. Tony Manero owns a small company that refinishes and maintains the wood flooring of many dance clubs in Brooklyn. Because of heavy use, his services are required at least quarterly by most of the clubs. Tony's annual fixed costs consist of depreciation expense for his van, polishing equipment, and other tools. These expenses were $9,000 this year. His variable costs include wood-staining products, wax, and other miscellaneous supplies. Tony has been in this business since 1977 and accurately estimates his variable costs at $1.50 per square yard of dance floor. Tony charges a rate of $15 per square yard.

Breakeven Analysis

a. How many square yards of dance floor will he need to work on this year to cover all of his expenses but leave him with zero operating income?

b. What is this number called?

c. Calculate the breakeven point in dollar sales.

d. Tony has little competent competition in the Brooklyn area. What happens to the breakeven point in sales dollars if Tony increases his rate to $18 per square yard?

e. At the $18 per square yard rate, what are Tony's operating income and net income if he completes work on 14,000 square yards this year? Assume his tax rate is 40 percent and he has a $25,000 loan outstanding on which he pays 12 percent interest annually.

13-10. Otis Day's company manufactures and sells men's suits. His trademark gray flannel suits are popular on Wall Street and in boardrooms throughout the East. Each suit sells for $800. Fixed costs are $200,000 and variable costs are $250 per suit.

Operating Leverage and Breakeven Analysis

a. What is the firm's operating income on sales of 600 suits? On sales of 3,000 suits?

b. What is Mr. Day's degree of operating leverage (DOL) at a sales level of 600 suits? At a sales level of 3,000 suits?

c. Calculate Mr. Day's breakeven point in sales units and sales dollars.

d. If the cost of the gray flannel material increases so that Mr. Day's variable costs are now $350 per suit, what will be his new breakeven point in sales units and sales dollars?

e. Considering the increase in variable costs, by how much will he need to increase the selling price per suit to reach the original operating income for sales of 3,000 suits calculated in part *a*?

Operating Leverage

13-11. Company A, Company B, and Company C all manufacture and sell identical products. They each sell 12,000 units annually at a price of $10 per unit. Assume Company A has $0 fixed costs and variable costs of $5 per unit. Company B has $10,000 in fixed costs and $4 in variable costs per unit. Company C has $40,000 fixed costs and $1 per unit variable costs.

a. Calculate the operating income (EBIT) for each of the three companies.

b. Before making any further calculations, rank the companies from highest to lowest by their relative degrees of operating leverage. Remember what you read about how fixed costs affect operating leverage.

Operating Leverage

13-12. Faber Corporation, a basketball hoop manufacturing firm in Hickory, Indiana, plans to branch out and begin producing basketballs in addition to basketball hoops. It has a choice of two different production methods for the basketballs. Method 1 will have variable costs of $6 per ball and fixed costs of $700,000 for the high-tech machinery, which requires little human supervision. Method 2 employs many people to hand-sew the basketballs. It has variable costs of $16.50 per ball, but fixed costs are estimated to be only $100,000. Regardless of which method CEO Norman Dale chooses, the basketballs will sell for $30 each. Marketing research indicates sales in the first year will be 50,000 balls. Sales volume is expected to increase to 60,000 in year 2.

a. Calculate the sales revenue expected in years 1 and 2.

b. Calculate the percentage change in sales revenue.

c. Calculate the earnings before interest and taxes for each year for both production methods.

d. Calculate the percentage change in EBIT for each method.

e. Calculate the year 1 degree of operating leverage for each method, using your answers from parts b and d.

f. Calculate the degree of operating leverage again. This time use only revenue, fixed costs and variable costs from year 1 (your base year) for each production method.

g. Under which production method would EBIT be more adversely affected if the sales volume did not reach the expected levels?

h. What would drive this adverse effect on EBIT?

i. Recalculate the year 1 base year EBIT and the degree of operating leverage for both production methods if year 2 sales are expected to be only 53,000 units.

Financial Leverage

13-13. Three companies manufacture and sell identical products. They each have earnings before interest and taxes of $100,000. Assume Company A is an all-equity company and, therefore, has zero debt. Company B's capital structure is 10 percent debt and 90 percent equity. It makes annual interest payments of $2,000. Company C's capital structure is just the opposite of B. It has 90 percent debt and 10 percent equity. Company C has annual interest expense of $40,000. The tax rate for each of the three companies is 40 percent.

a. Before making any calculations, rank the companies from highest to lowest by their relative degrees of financial leverage (DFL). Remember what you read about how debt and the interest expense that comes with it affects financial leverage.

b. Calculate the degree of financial leverage for each company. Was your answer to *a* correct?

c. Calculate the net income for each company.

13-14. Michael Dorsey and Dorothy Michaels each own their own companies. They design and supply custom-made costumes for Broadway plays. The income statement from each company shows they each have earnings before interest and taxes of $50,000 this year. Mr. Dorsey has an outstanding loan for $70,000, on which he pays 13 percent interest annually. When she started her business, Ms. Michaels only needed to borrow $10,000. She is still paying 9 percent annual interest on the loan. Each company expects EBIT for next year to be $60,000. The tax rate for each is 40 percent and is not expected to change for next year.

Financial Leverage

a. Calculate the net income for each company for this year and next year.

b. Calculate the percentage change in net income for each company.

c. Calculate the percentage change in EBIT for each company.

d. Calculate this year's degree of financial leverage for each company using your answers from parts b and c.

e. Calculate the degree of financial leverage for each company again. This time use only EBIT and interest expense for this year.

f. If earnings before interest and taxes do not reach the expected levels, in which company would net income be more adversely affected?

g. What would drive this adverse effect on net income?

h. Recalculate the degree of financial leverage and the net income expected for next year for both companies if EBIT only increases to $53,000.

13-15. In 2006, Calaire had net income of $75,000 and sales of $230,000. John Mastore, the financial manager, has forecast the 2007 net income to be $200,000 and sales to be $400,000. What is Calaire's degree of combined leverage if these numbers become fact?

Degree of Combined Leverage

13-16. Fanny Brice, owner of Funny Girl Comics, has sales revenue of $200,000, earnings before interest and taxes of $95,000, and net income of $30,000 this year. She is expecting sales to increase to $225,000 next year. The degree of operating leverage is 1.35 and the degree of financial leverage is relatively low at 1.09.

Challenge Problem

a. Calculate the percentage change in EBIT Ms. Brice can expect between this year and next year.

b. How much will EBIT be next year in dollars?

c. Calculate the percentage change in net income Ms. Brice can expect between this year and next year.

d. How much net income should Ms. Brice expect next year?

e. Calculate this year's degree of combined leverage (DCL).

f. Ms. Brice is considering a price increase. This would mean the percentage change in sales revenue between this year and next year would be 20 percent. If this is true, what net income (in dollars) can she expect for next year?

Degree of Combined Leverage

13-17. Clint Reno owns Real Cowboy, a western wear store that has current annual sales of $2,800,000. The degree of operating leverage (DOL) is 1.4. EBIT is $600,000. Real Cowboy has $2 million in debt, on which it pays 10 percent annual interest. Calculate the degree of combined leverage for Real Cowboy.

DOL, DFL, and DCL Interactions

13-18. Chad Gates owns Strings Attached, a store that sells guitars. The company has $5 million in current annual sales, fixed operating costs of $300,000, and $700,000 in variable operating costs, for a total EBT of $2.5 million. The firm has debt of $16,666,666.67, on which it pays 9 percent annual interest. The degree of combined leverage (DCL) for Strings Attached is 1.72.

a. Calculate the degree of operating leverage (DOL).

b. What is the degree of financial leverage (DFL) for Strings Attached? Calculate your answer using the EBIT and interest expense figures and your knowledge of how DOL and DFL jointly determine DCL.

c. If sales next year increase by 20 percent, what will be the percent change in net income?

Comprehensive Problem

13-19. Soccer International, Inc., produces and sells soccer balls. Partial information from the income statements for 2005 and 2006 follows.

Soccer International, Inc., Income Statement for the Year Ending December 31

	2005	2006
Sales Revenue	$560,000	616,000
Variable Costs	240,000	264,000
Fixed Costs	160,000	160,000
EBIT	_____	_____
Interest Expense	40,000	40,000
EBT	_____	_____
Income Taxes (30%)	_____	_____
Net Income	_____	_____

Soccer International sells each soccer ball for $16.

a. Fill in the missing values in the income statements of 2005 and 2006.

b. Calculate Soccer International's breakeven point in sales units for 2005 and 2006.

c. Calculate the breakeven point in dollar sales for 2005 and for 2006.

d. How many soccer balls need to be sold to have an operating income of $200,000 in 2005?

e. What is the operating profit (loss) if the company sells (i) 18,000 and (ii) 24,000 balls in 2005?

f. Calculate the degree of operating leverage for 2005 and for 2006.

g. If sales revenue is expected to increase by 10 percent in 2006, calculate the percentage increase in EBIT and the dollar amount of EBIT for 2006.

h. Calculate the degree of financial leverage for 2005 and for 2006.

i. Calculate the percentage change in net income and the dollar amount of net income expected in 2006.

j. Calculate the degree of combined leverage for 2005 and for 2006.

k. Assume Soccer International raises its selling price and that sales revenue increases to $650,000 in 2006. How much net income can be expected in 2006?

13-20. Los Amigos has an operating income of $35,000 in 2006 and a projected operating income of $50,000 in 2007. It estimates its DFL to be 1.71. At this estimated DFL, what will be the change in net income?

Percentage Change in Net Income

Answers to Self-Test

ST-1. Sales breakeven point (in units)
= $40,000 ÷ ($9.00 – $4.00) = 8,000 units

ST-2. Degree of operating leverage (DOL)
= ($225,000 – $100,000) ÷ ($225,000 – $100,000 – $40,000) = 1.47

ST-3. Degree of financial leverage (DFL)
= $85,000 ÷ ($85,000 – $10,000) = 1.13

ST-4. Weighted average cost of capital, k_a
= (.3 × 6%) + (.7 × 14%) = 11.6%

ST-5. Next year's change in EBIT equals (this year's EBIT × 20% × 1.4) + this year's EBIT
= ($100,000 × 20% × 1.4) + $100,000
= $128,000

ST-6. Degree of combined leverage (DCL) = DOL × DFL
= 1.6 × 1.8 = 2.88

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