

CHAPTER 11

Cost Behavior, Operating Leverage, and Profitability Analysis

LEARNING OBJECTIVES

After you have mastered the material in this chapter, you will be able to:

- 1** Identify and describe fixed, variable, and mixed cost behavior.
- 2** Demonstrate the effects of operating leverage on profitability.
- 3** Prepare an income statement using the contribution margin approach.
- 4** Calculate the magnitude of operating leverage.
- 5** Demonstrate how the relevant range and decision context affect cost behavior.
- 6** Calculate the break-even point.
- 7** Calculate the sales volume required to attain a target profit.
- 8** Calculate the margin of safety in units, dollars, and percentage.

CHAPTER OPENING

Three college students are planning a vacation. One of them suggests inviting a fourth person along, remarking that four can travel for the same cost as three. Certainly, some costs will be the same whether three or four people go on the trip. For example, the hotel room costs \$800 per week, regardless of whether three or four people stay in the room. In accounting terms the cost of the hotel room is a fixed cost. The total amount of a fixed cost does not change when volume changes. The total hotel room cost is \$800 whether 1, 2, 3, or 4 people use the room. In contrast, some costs vary in direct proportion with changes in volume. When volume increases, total variable cost

increases; when volume decreases, total variable cost decreases. For example, the cost of tickets to a theme park is a **variable cost**. The total cost of tickets increases proportionately with each vacationer who goes to the theme park. Cost behavior (fixed versus variable) can significantly impact profitability. This chapter explains cost behavior and ways it can be used to increase profitability.

The Curious Accountant

News flash! On April 29, 2009, **Eastman Kodak, Inc.**, announced that its first quarter's revenues decreased 29 percent compared to the same quarter in 2008, yet its earnings had decreased by 213 percent. On May 4, 2009,

Walt Disney announced that a decrease in revenue of 7 percent for the just-ended quarter would cause its earnings to decrease 46 percent compared to the same quarter in 2008. On April 12, 2009, **Apple** computer reported that its revenue for the quarter had increased by 9 percent compared to the previous year, but its earnings increased by 15 percent.

Can you explain why such relatively small changes in these companies' revenues resulted in such relatively large changes in their earnings or losses? In other words, if a company's sales increase 10 percent, why do its earnings not also increase 10 percent? (Answer on page 402.)



FIXED COST BEHAVIOR

LO 1

Identify and describe fixed, variable, and mixed cost behavior.

How much more will it cost to send one additional employee to a sales meeting? If more people buy our products, can we charge less? If sales increase by 10 percent, how will profits be affected? Managers seeking answers to such questions must consider **cost behavior**. Knowing how costs behave relative to the level of business activity enables managers to more effectively plan and control costs. To illustrate, consider the entertainment company Star Productions, Inc. (SPI).

SPI specializes in promoting rock concerts. It is considering paying a band \$48,000 to play a concert. Obviously, SPI must sell enough tickets to cover this cost. In this example, the relevant activity base is the number of tickets sold. The cost of the band is a **fixed cost** because it does not change regardless of the number of tickets sold. Exhibit 11.1 illustrates the fixed cost behavior pattern, showing the *total cost* and the *cost per unit* at three different levels of activity.

Total versus per-unit fixed costs behave differently. The total cost for the band remains constant (fixed) at \$48,000. In contrast, fixed cost per unit decreases as volume (number of tickets sold) increases. The term *fixed cost* is consistent with the behavior of *total cost*. Total fixed cost remains constant (fixed) when activity changes. However, there is a contradiction between the term *fixed cost per unit* and the *per-unit behavior pattern of a fixed cost*. Fixed cost per unit is *not* fixed. It changes with the number of tickets sold. This contradiction in terminology can cause untold confusion. Study carefully the fixed cost behavior patterns in Exhibit 11.2.

EXHIBIT 11.1

Fixed Cost Behavior			
Number of tickets sold (a)	2,700	3,000	3,300
Total cost of band (b)	\$48,000	\$48,000	\$48,000
Cost per ticket sold (b ÷ a)	\$17.78	\$16.00	\$14.55

EXHIBIT 11.2

Fixed Cost Behavior		
	When Activity Increases	When Activity Decreases
Total fixed cost	Remains constant	Remains constant
Fixed cost per unit	Decreases	Increases

The fixed cost data in Exhibit 11.1 help SPI's management decide whether to sponsor the concert. For example, the information influences potential pricing choices. The per-unit costs represent the minimum ticket prices required to cover the fixed cost at various levels of activity. SPI could compare these per-unit costs to the prices of competing entertainment events (such as the prices of movies, sporting events, or theater tickets). If the price is not competitive, tickets will not sell and the concert will lose money. Management must also consider the number of tickets to be sold. The volume data in Exhibit 11.1 can be compared to the band's track record of ticket sales at previous concerts. A proper analysis of these data can reduce the risk of undertaking an unprofitable venture.

OPERATING LEVERAGE

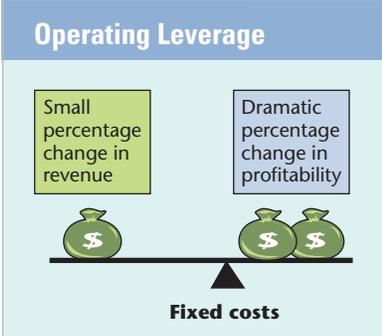
LO 2

Demonstrate the effects of operating leverage on profitability.

Heavy objects can be moved with little effort using *physical leverage*. Business managers apply **operating leverage** to magnify small changes in revenue into dramatic changes in profitability. The *lever* managers use to achieve disproportionate changes between revenue and profitability is fixed costs. The leverage relationships between revenue, fixed costs, and profitability are displayed in Exhibit 11.3.

When all costs are fixed, every sales dollar contributes one dollar toward the potential profitability of a project. Once sales dollars cover fixed costs, each

EXHIBIT 11.3



FOCUS ON INTERNATIONAL ISSUES

COST-VOLUME-PROFIT ANALYSIS AT A GERMAN CHEMICAL COMPANY

The greater the percentage of a company’s total costs that are fixed, the more sensitive the company’s earnings are to changes in revenue or volume. Operating leverage, the relationship between the changes in revenue and changes in earnings, introduced earlier, applies to companies throughout the world, large or small.

Large chemical manufacturers have significant fixed costs. It takes a lot of buildings and equipment to produce chemicals. **BASF** claims to be the largest chemical company in the world. It has its headquarters in Ludwigshafen, Germany. From 2004 through 2006 BASF’s revenues increased 40.2 percent, but its earnings increased 60.4 percent. In other words, its earnings grew one and one-half times faster than its revenues.

Studying BASF offers insight into a true global enterprise. Though headquartered in Germany, it has manufacturing facilities at 150 locations throughout the world. Only 21 percent of its 2006 revenue came from sales within Germany, which was 1 percent less than the revenue it earned in the United States. Although its financial statements are presented in euros and prepared in accordance with international financial accounting standards, its stock is traded on the New York Stock Exchange as well as on the Frankfurt Stock Exchange.



additional sales dollar represents pure profit. As a result, a small change in sales volume can significantly affect profitability. To illustrate, assume SPI estimates it will sell 3,000 tickets for \$18 each. A 10 percent difference in actual sales volume will produce a 90 percent difference in profitability. Examine the data in Exhibit 11.4 to verify this result.¹

EXHIBIT 11.4

Effect of Operating Leverage on Profitability

Number of tickets sold	<u>2,700</u>	← -10% ←	<u>3,000</u>	⇒ +10% ⇒	<u>3,300</u>
Sales revenue (\$18 per ticket)	\$48,600		\$54,000		\$59,400
Cost of band (fixed cost)	<u>(48,000)</u>		<u>(48,000)</u>		<u>(48,000)</u>
Gross margin	<u>\$ 600</u>	← -90% ←	<u>\$ 6,000</u>	⇒ +90% ⇒	<u>\$11,400</u>

Calculating Percentage Change

The percentages in Exhibit 11.4 are computed as follows.

$$(\text{Alternative measure} - \text{Base measure}) \div \text{Base measure} = \% \text{ change}$$

The base measure is the starting point. To illustrate, compute the percentage change in gross margin when moving from 3,000 units (base measure) to 3,300 units (the alternative measure).

$$(\text{Alternative measure} - \text{Base measure}) \div \text{Base measure} = \% \text{ change}$$

$$(\$11,400 - \$6,000) \div \$6,000 = 90\%$$

¹Do not confuse operating leverage with financial leverage. Companies employ *financial leverage* when they use debt to profit from investing money at a higher rate of return than the rate they pay on borrowed money. Companies employ *operating leverage* when they use proportionately more fixed costs than variable costs to magnify the effect on earnings of changes in revenues.

The percentage *decline* in profitability is similarly computed:

$$\begin{aligned} & (\text{Alternative measure} - \text{Base measure}) \div \text{Base measure} = \% \text{ change} \\ & (\$600 - \$6,000) \div \$6,000 = (90\%) \end{aligned}$$

Risk and Reward Assessment

Risk refers to the possibility that sacrifices may exceed benefits. A fixed cost represents a commitment to an economic sacrifice. It represents the ultimate risk of undertaking a particular business project. If SPI pays the band but nobody buys a ticket, the company will lose \$48,000. SPI can avoid this risk by substituting *variable costs* for the *fixed cost*.

REALITY BYTES

The relationship among the costs to produce goods, the volume of goods produced, the price charged for those goods, and the profit earned is relevant to all industries, but perhaps no industry demonstrates the effects of these relationships more dramatically than automobile manufacturing. First, the automobile industry is characterized by having a lot of fixed production-costs for things such as buildings, equipment, research, and development, but also financing costs associated with borrowed funds, such as the interest expense on bonds. Second, the industry is globally competitive, and companies in the United States are often at a cost disadvantage. Some of this cost disadvantage comes from obvious sources, such as having to pay higher wages than do companies in countries such as South Korea. Finally, for many customers, price and quality are more important than brand loyalty.

Over the past decades, domestic auto makers, and in particular **General Motors (GM)**, have used different strategies to try to deal with the issues mentioned above. Early on, it had a dominant market share. As long as it produced more cars than its competitors, its fixed cost per car was lower, resulting in better profits. In the 1980s, however, foreign manufactures began increasing their market share and decreasing GM's. As its relative levels of production fell, its fixed cost per unit increased. In response, GM and others tried to regain market share by lowering prices, largely through rebates. Unfortunately this did not work, so the lower prices, combined with the higher relative fixed costs, seriously eroded profits.

These problems reached a crisis in 2008 and 2009 when GM and **Chrysler** sought financial help from the government and entered expedited bankruptcy proceedings.

What did GM and Chrysler hope to achieve? Primarily they needed to lower their costs, especially their fixed costs. As a result of bankruptcy proceedings, they were able to greatly reduce interest and principal payments on their outstanding bonds (fixed costs), reduce the number of brands (fixed costs), shut down some plants (fixed costs), reduce health care costs to retirees (fixed costs), and reduce the number of dealers. While reducing the number of dealers did reduce some cost to the companies, it also reduced price competition among the dealers, which had the potential of allowing the companies to charge more for their cars. All of these changes, it was hoped, would allow the companies to return to profitability.

However, before a company can be profitable, it must break even. At one time GM's break-even point was estimated at around 16 million vehicles per year. GM's CEO until 2000, Rick Wagoner, had implemented changes that reduced the company's break-even point to 12 million units. On March 29, 2009, as a condition of receiving government support, the administration of President Barack Obama asked Mr. Wagoner to resign as GM's CEO. Perhaps lost by many in the news coverage of Mr. Wagoner's resignation were reports by several news organizations that officials at the U.S. Treasury Department would ask the new leadership at GM to take steps to reduce the company's break-even point to 10 million units.

It would be a major achievement if GM can reduce its break even from 16 million units to 10 million units in the span of a few years. This may not be enough, however. In 2008 GM sold only 8.8 million units, and its sales in the first quarter of 2009 were even lower than the same quarter of 2008. Furthermore, it should be remembered that the objective of businesses is not simply to break even, but to make a profit.



VARIABLE COST BEHAVIOR

To illustrate variable cost behavior, assume SPI arranges to pay the band \$16 per ticket sold instead of a fixed \$48,000. Exhibit 11.5 shows the total cost of the band and the cost per ticket sold at three different levels of activity.



Identify and describe fixed, variable, and mixed cost behavior.

EXHIBIT 11.5

Variable Cost Behavior			
Number of tickets sold (a)	2,700	3,000	3,300
Total cost of band (b)	\$43,200	\$48,000	\$52,800
Cost per ticket sold (b ÷ a)	\$16	\$16	\$16

Because SPI will pay the band \$16 for each ticket sold, the *total* variable cost increases in direct proportion to the number of tickets sold. If SPI sells one ticket, total band cost will be \$16 (1 × \$16); if SPI sells two tickets, total band cost will be \$32 (2 × \$16); and so on. The total cost of the band increases proportionately as ticket sales move from 2,700 to 3,000 to 3,300. The variable cost *per ticket* remains \$16, however, regardless of whether the number of tickets sold is 1, 2, 3, or 3,000. The behavior of variable cost *per unit* is contradictory to the word *variable*. Variable cost per unit remains *constant* regardless of how many tickets are sold. Study carefully the variable cost behavior patterns in Exhibit 11.6.

EXHIBIT 11.6

Variable Cost Behavior		
	When Activity Increases	When Activity Decreases
Total variable cost	Increases proportionately	Decreases proportionately
Variable cost per unit	Remains constant	Remains constant

Risk and Reward Assessment

Shifting the cost structure from fixed to variable enables SPI to avoid the fixed cost risk. If no one buys a ticket, SPI loses nothing because it incurs no cost. If only one person buys a ticket at an \$18 ticket price, SPI earns a \$2 profit (\$18 sales revenue – \$16 cost of band). Should managers therefore avoid fixed costs whenever possible? Not necessarily.



Demonstrate the effects of operating leverage on profitability.

Shifting the cost structure from fixed to variable reduces not only the level of risk but also the potential for profits. Managers cannot avoid the risk of fixed costs without also sacrificing the benefits. Variable costs do not offer operating leverage. Exhibit 11.7 shows that a variable cost structure produces a proportional relationship between sales and profitability. A 10 percent increase or decrease in sales results in a corresponding 10 percent increase or decrease in profitability.

EXHIBIT 11.7

Variable Cost Eliminates Operating Leverage					
Number of tickets sold	<u>2,700</u>	← -10% ←	<u>3,000</u>	⇒ +10% ⇒	<u>3,300</u>
Sales revenue (\$18 per ticket)	\$48,600		\$54,000		\$59,400
Cost of band (\$16 variable cost)	<u>(43,200)</u>		<u>(48,000)</u>		<u>(52,800)</u>
Gross margin	<u>\$ 5,400</u>	← -10% ←	<u>\$ 6,000</u>	⇒ +10% ⇒	<u>\$ 6,600</u>

✓ CHECK YOURSELF 11.1

Suppose that you are sponsoring a political rally at which Ralph Nader will speak. You estimate that approximately 2,000 people will buy tickets to hear Mr. Nader's speech. The tickets are expected to be priced at \$12 each. Would you prefer a contract that agrees to pay Mr. Nader \$10,000 or one that agrees to pay him \$5 per ticket purchased?

Answer Your answer would depend on how certain you are that 2,000 people will purchase tickets. If it were likely that many more than 2,000 tickets would be sold, you would be better off with a fixed cost structure, agreeing to pay Mr. Nader a flat fee of \$10,000. If attendance numbers are highly uncertain, you would be better off with a variable cost structure thereby guaranteeing a lower cost if fewer people buy tickets.

Answers to The Curious Accountant

The explanation for how a company's earnings can rise faster, as a percentage, than its revenue rises is operating leverage, and operating leverage is due entirely to fixed costs. As the chapter explains, when a company's output goes up, its fixed cost per unit goes down. As long as it can keep prices about the same, this lower unit cost will result in higher profit per unit sold. In real-world companies, the relationship between changing sales levels and changing earnings levels can be very complex, but the existence of fixed costs helps to explain why a 9 percent rise in revenue can cause a 15 percent rise in net earnings.

✓ CHECK YOURSELF 11.2

If both **Kroger Food Stores** and **Delta Airlines** were to experience a 5 percent increase in revenues, which company would be more likely to experience a higher percentage increase in net income?

Answer Delta would be more likely to experience a higher percentage increase in net income because a large portion of its cost (e.g., employee salaries and depreciation) is fixed, while a large portion of Kroger's cost is variable (e.g., cost of goods sold).

AN INCOME STATEMENT UNDER THE CONTRIBUTION MARGIN APPROACH

LO 3

Prepare an income statement using the contribution margin approach.

The impact of cost structure on profitability is so significant that managerial accountants frequently construct income statements that classify costs according to their behavior patterns. Such income statements first subtract variable costs from revenue; the resulting subtotal is called the **contribution margin**. The contribution margin represents the amount available to cover fixed expenses and thereafter to provide company profits. Net income is computed by subtracting the fixed costs from the contribution margin. A contribution margin style income statement cannot be used for public reporting (GAAP prohibits its use in external financial reports), but it is widely used for internal reporting

purposes. Exhibit 11.8 illustrates income statements prepared using the contribution margin approach.

EXHIBIT 11.8		
Income Statements		
	Company Name	
	Bragg	Biltmore
Variable cost per unit (a)	\$ 6	\$ 12
Sales revenue (10 units × \$20)	\$200	\$200
Variable cost (10 units × a)	(60)	(120)
Contribution margin	140	80
Fixed cost	(120)	(60)
Net income	<u>\$ 20</u>	<u>\$ 20</u>

MEASURING OPERATING LEVERAGE USING CONTRIBUTION MARGIN

A contribution margin income statement allows managers to easily measure operating leverage. The magnitude of operating leverage can be determined as follows.

LO 4

$$\text{Magnitude of operating leverage} = \frac{\text{Contribution margin}}{\text{Net income}}$$

Calculate the magnitude of operating leverage.

Applying this formula to the income statement data reported for Bragg Company and Biltmore Company in Exhibit 11.8 produces the following measures.

Bragg Company:

$$\text{Magnitude of operating leverage} = \frac{140}{20} = 7$$

Biltmore Company:

$$\text{Magnitude of operating leverage} = \frac{80}{20} = 4$$

The computations show that Bragg is more highly leveraged than Biltmore. Bragg’s change in profitability will be seven times greater than a given percentage change in revenue. In contrast, Biltmore’s profits change by only four times the percentage change in revenue. For example, a 10 percent increase in revenue produces a 70 percent increase (10 percent × 7) in profitability for Bragg Company and a 40 percent increase (10 percent × 4) in profitability for Biltmore Company. The income statements in Exhibits 11.9 and 11.10 confirm these expectations.

EXHIBIT 11.9			
Comparative Income Statements for Bragg Company			
Units (a)	<u>10</u>		<u>11</u>
Sales revenue (\$20 × a)	\$200	⇒ +10% ⇒	\$220
Variable cost (\$6 × a)	(60)		(66)
Contribution margin	140		154
Fixed cost	(120)		(120)
Net income	<u>\$ 20</u>	⇒ +70% ⇒	<u>\$ 34</u>

EXHIBIT 11.10			
Comparative Income Statements for Biltmore Company			
Units (a)	<u>10</u>		<u>11</u>
Sales revenue (\$20 × a)	\$200	⇒ +10% ⇒	\$220
Variable cost (\$12 × a)	(120)		(132)
Contribution margin	80		88
Fixed cost	(60)		(60)
Net income	<u>\$ 20</u>	⇒ +40% ⇒	<u>\$ 28</u>

Operating leverage itself is neither good nor bad; it represents a strategy that can work to a company’s advantage or disadvantage, depending on how it is used. The next section explains how managers can use operating leverage to create a competitive business advantage.

CHECK YOURSELF 11.3

Boeing Company’s 2001 10K annual report filed with the Securities and Exchange Commission refers to “higher commercial airlines segment margins.” Is Boeing referring to gross margins or contribution margins?

Answer Because the data come from the company’s external annual report, the reference must be to gross margins (revenue – cost of goods sold), a product cost measure. The contribution margin (revenue – variable cost) is a measure used in internal reporting.

COST BEHAVIOR SUMMARIZED

LO 1

Identify and describe fixed, variable, and mixed cost behavior.

The term *fixed* refers to the behavior of *total* fixed cost. The cost *per unit* of a fixed cost *varies inversely* with changes in the level of activity. As activity increases, fixed cost per unit decreases. As activity decreases, fixed cost per unit increases. These relationships are graphed in Exhibit 11.11.

The term *variable* refers to the behavior of *total* variable cost. Total variable cost increases or decreases proportionately with changes in the volume of activity. In contrast, variable cost *per unit* remains *fixed* at all levels of activity. These relationships are graphed in Exhibit 11.12.

The relationships between fixed and variable costs are summarized in the chart in Exhibit 11.13. Study these relationships thoroughly.

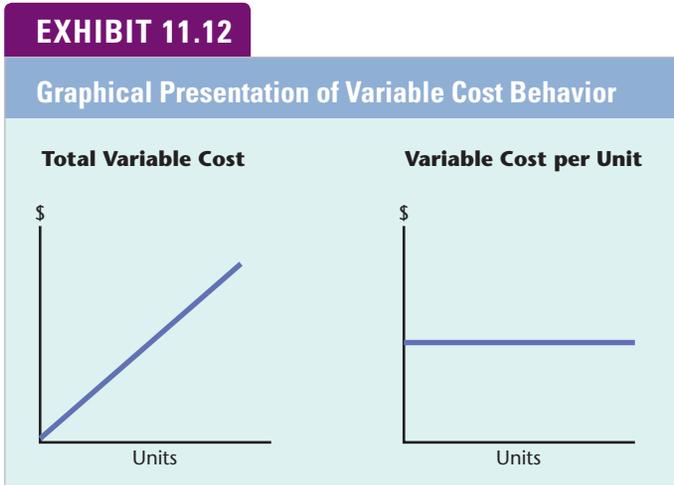
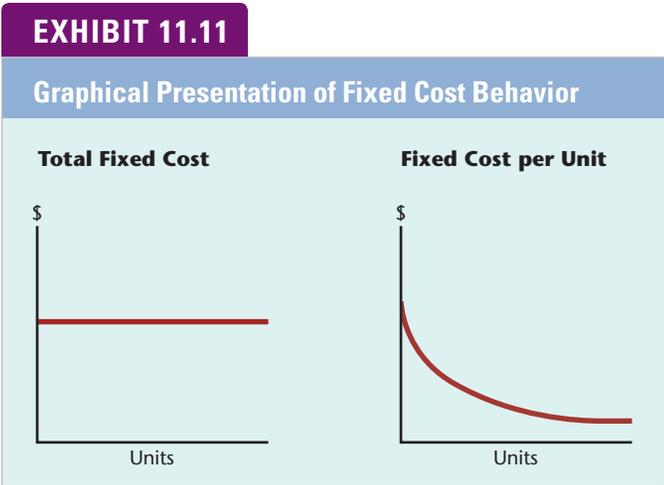


EXHIBIT 11.13

Fixed and Variable Cost Behavior

When Activity Level Changes	Total Cost	Cost per Unit
Fixed costs	Remains constant	Changes <i>inversely</i>
Variable costs	Changes in direct proportion	Remains constant

Mixed Costs (Semivariable Costs)

Mixed costs (semivariable costs) include both fixed and variable components. For example, Star Productions, Inc., frequently arranges backstage parties at which VIP guests meet members of the band. Party costs typically include a room rental fee and the costs of refreshments. The room rental fee is fixed; it remains unchanged regardless of the number of party guests. In contrast, the refreshments costs are variable; they depend on the number of people attending the party. The total party cost is a mixed cost.

Assuming a room rental fee of \$1,000 and refreshments costs of \$20 per person, the total mixed cost at any volume of activity can be computed as follows.

$$\text{Total cost} = \text{Fixed cost} + (\text{Variable cost per party guest} \times \text{Number of guests})$$

If 60 people attend the backstage party the total mixed cost is

$$\text{Total cost} = \$1,000 + (\$20 \times 60) = \$2,200$$

If 90 people attend the backstage party the total mixed cost is

$$\text{Total cost} = \$1,000 + (\$20 \times 90) = \$2,800$$

Exhibit 11.14 illustrates a variety of mixed costs businesses commonly encounter.

EXHIBIT 11.14

Examples of Mixed Costs

Type of Cost	Fixed Cost Component(s)	Variable Cost Component(s)
Cost of sales staff	Monthly salary	Bonus based on sales volume
Truck rental	Monthly rental fee	Cost of gas, tires, and maintenance
Legal fees	Monthly retainer	Reimbursements to attorney for out-of-pocket costs (copying, postage, travel, filing fees)
Outpatient service cost	Salaries of doctors and nurses, depreciation of facility, utilities	Medical supplies such as bandages, sterilization solution, and paper products
Phone services	Monthly connection fee	Per-minute usage fee
LP gas utility cost	Container rental fee	Cost of gas consumed
Cable TV services	Monthly fee	Pay-per-view charges
Training cost	Instructor salary, facility cost	Textbooks, supplies
Shipping and handling	Salaries of employees who process packages	Boxes, packing supplies, tape, and other shipping supplies, postage
Inventory holding cost	Depreciation on inventory warehouse, salaries of employees managing inventory	Delivery costs, interest on funds borrowed to finance inventory, cost of supplies

The Relevant Range

Suppose SPI, the rock concert promoter mentioned earlier, must pay \$5,000 to rent a concert hall with a seating capacity of 4,000 people. Is the cost of the concert hall fixed or variable? Because total cost remains unchanged regardless of whether one ticket, 4,000 tickets, or any number in between is sold, the cost is fixed relative to ticket sales. However, what if demand for tickets is significantly more than 4,000? In that case, SPI might rent a larger concert hall at a higher cost. In other words, *the cost is fixed only for a designated range of activity (1 to 4,000)*.

A similar circumstance affects many variable costs. For example, a supplier may offer a volume discount to buyers who purchase more than a specified number of products. The point is that descriptions of cost behavior pertain to a specified range of activity. The range of activity over which the definitions of fixed and variable costs are valid is commonly called the **relevant range**.

LO 5

Demonstrate how the relevant range and decision context affect cost behavior.

Context-Sensitive Definitions of Fixed and Variable

The behavior pattern of a particular cost may be either fixed or variable, depending on the context. For example, the cost of the band was fixed at \$48,000 when SPI was considering hiring it to play a single concert. Regardless of how many tickets SPI sold, the total band cost was \$48,000. However, the band cost becomes variable if SPI decides to hire it to perform at a series of concerts. The total cost and the cost per concert for one, two, three, four, or five concerts are shown in Exhibit 11.15.

In this context, the total cost of hiring the band increases proportionately with the number of concerts while cost per concert remains constant. The band cost is therefore variable. The same cost can behave as either a fixed cost or a variable cost, depending on the **activity base**. When identifying a cost as fixed or variable, first ask, fixed or variable *relative to what activity base*? The cost of the band is fixed relative to *the number of tickets sold for a specific concert*; it is variable relative to *the number of concerts produced*.

EXHIBIT 11.15 Cost Behavior Relative to Number of Concerts					
Number of concerts (a)	1	2	3	4	5
Cost per concert (b)	\$48,000	\$48,000	\$ 48,000	\$ 48,000	\$ 48,000
Total cost (a × b)	\$48,000	\$96,000	\$144,000	\$192,000	\$240,000



CHECK YOURSELF 11.4

Is the compensation cost for managers of **Pizza Hut Restaurants** a fixed cost or a variable cost?

Answer The answer depends on the context. For example, because a store manager’s salary remains unchanged regardless of how many customers enter a particular restaurant, it can be classified as a fixed cost relative to the number of customers at a particular restaurant. However, the more restaurants that Pizza Hut operates, the higher the total managers’ compensation cost will be. Accordingly, managers’ salary cost would be classified as a variable cost relative to the number of restaurants opened.

DETERMINING THE BREAK-EVEN POINT

LO 6

Calculate the break-even point.

Bright Day Distributors sells nonprescription health food supplements including vitamins, herbs, and natural hormones in the northwestern United States. Bright Day recently obtained the rights to distribute the new herb mixture Delatine. Recent scientific research found that Delatine delayed aging in laboratory animals. The researchers hypothesized that the substance would have a similar effect on humans. Their theory could not be confirmed because of the relatively long human life span. The news media reported the research findings; as stories turned up on television and radio news, talk shows, and in magazines, demand for Delatine increased.

Bright Day plans to sell the Delatine at a price of \$36 per bottle. Delatine costs \$24 per bottle. Bright Day’s management team suspects that enthusiasm for Delatine will abate quickly as the news media shift to other subjects. To attract customers immediately, the product managers consider television advertising. The marketing

manager suggests running a campaign of several hundred cable channel ads at an estimated cost of \$60,000.

Bright Day's first concern is whether it can sell enough units to cover its costs. The president made this position clear when he said, "We don't want to lose money on this product. We have to sell at least enough units to break even." In accounting terms, the **break-even point** is where profit (income) equals zero. So how many bottles of Delatine must be sold to produce a profit of zero? The break-even point is commonly computed using either the *equation method*, or the *contribution margin per unit method*. Both of these approaches produce the same result. They are merely different ways to arrive at the same conclusion.

Equation Method

The **equation method** begins by expressing the income statement as follows.

$$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit (Net income)}$$

As previously stated, profit at the break-even point is zero. Therefore, the break-even point for Delatine is computed as follows.

$$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit}$$

$$\$36N - \$24N - \$60,000 = \$0$$

$$\$12N = \$60,000$$

$$N = \$60,000 \div \$12$$

$$N = 5,000 \text{ Units}$$

Where:

N = Number of units

\$36 = Sales price per unit

\$24 = Variable cost per unit

\$60,000 = Fixed costs



CHECK YOURSELF 11.5

B-Shoc is an independent musician who is considering whether to independently produce and sell a CD. B-Shoc estimates fixed costs of \$5,400 and variable costs of \$2.00 per unit. The expected selling price is \$8.00 per CD. Use the equation method to determine B-Shoc's break-even point.

Answer

$$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit}$$

$$\$8N - \$2N - \$5,400 = \$0$$

$$\$6N = \$5,400$$

$$N = \$5,400 \div \$6$$

$$N = 900 \text{ Units (CDs)}$$

Where:

N = Number of units

\$8 = Sales price per unit

\$2 = Variable cost per unit

\$5,400 = Fixed costs

Contribution Margin Per Unit Method

Recall that the *total contribution margin* is the amount of sales minus total variable cost. The **contribution margin per unit** is the sales price per unit minus the variable cost per unit. Therefore, the contribution margin per unit for Delatine is

Sales price per unit	\$36
Less: Variable cost per unit	<u>(24)</u>
Contribution margin per unit	<u>\$12</u>

For every bottle of Delatine it sells, Bright Day earns a \$12 contribution margin. In other words, every time Bright Day sells a bottle of Delatine, it receives enough money to pay \$24 to cover the variable cost of the bottle of Delatine and still has \$12 left to go toward paying the fixed cost. Bright Day will reach the break-even point when it sells enough bottles of Delatine to cover its fixed costs. Therefore the break-even point can be determined as follows.

$$\text{Break-even point in units} = \frac{\text{Fixed costs}}{\text{Contribution margin per unit}}$$

$$\text{Break-even point in units} = \frac{\$60,000}{\$12}$$

$$\text{Break-even point in units} = 5,000 \text{ Units}$$

This result is the same as that determined under the equation method. Indeed, the contribution margin per unit method formula is an abbreviated version of the income statement formula used in the equation method. The proof is provided in the footnote below.²

Both the *equation method* and the *contribution margin per unit method* yield the amount of break-even sales measured *in units*. To determine the amount of break-even sales measured *in dollars*, multiply the number of units times the sales price per unit. For Delatine the break-even point measured in dollars is \$180,000 (5,000 units × \$36 per unit). The following income statement confirms this result.

Sales revenue (5,000 units × \$36)	\$180,000
Total variable expenses (5,000 units × \$24)	<u>(120,000)</u>
Total contribution margin (5,000 units × \$12)	60,000
Fixed expenses	<u>(60,000)</u>
Net income	<u>\$ 0</u>

²The formula for the *contribution margin per unit method* is (where N is the number of units at the break-even point).

$$N = \text{Fixed costs} \div \text{Contribution margin per unit}$$

The income statement formula for the *equation method* produces the same result as shown below (where N is the number of units at the break-even point).

$$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit}$$

$$\text{Sales price per unit (N)} - \text{Variable cost per unit (N)} - \text{Fixed costs} = \text{Profit}$$

$$\text{Contribution margin per unit (N)} - \text{Fixed costs} = \text{Profit}$$

$$\text{Contribution margin per unit (N)} - \text{Fixed costs} = 0$$

$$\text{Contribution margin per unit (N)} = \text{Fixed costs}$$

$$N = \text{Fixed costs} \div \text{Contribution margin per unit}$$

DETERMINING THE SALES VOLUME NECESSARY TO REACH A DESIRED PROFIT

Bright Day’s president decides the ad campaign should produce a \$40,000 profit. He asks the accountant to determine the sales volume that is required to achieve this level of profitability. Using the *equation method*, the sales volume in units required to attain the desired profit is computed as follows.

$$\begin{aligned}
 \text{Sales} - \text{Variable costs} - \text{Fixed costs} &= \text{Profit} \\
 \$36N - \$24N - \$60,000 &= \$40,000 \\
 \$12N &= \$60,000 + \$40,000 \\
 N &= \$100,000 \div \$12 \\
 N &= 8,333 \text{ Units}
 \end{aligned}$$

Where:

- N = Number of units
- \$36 = Sales price per unit
- \$24 = Variable cost per unit
- \$60,000 = Fixed costs
- \$40,000 = Desired profit

The accountant used the *contribution margin per unit method* to confirm these computations as follows.

$$\begin{aligned}
 \text{Sales volume in units} &= \frac{\text{Fixed costs} + \text{Desired profit}}{\text{Contribution margin per unit}} \\
 &= \frac{\$60,000 + \$40,000}{\$12} = 8,333.33 \text{ units}
 \end{aligned}$$

The required volume in sales dollars is this number of units multiplied by the sales price per unit (8,333.33 units × \$36 = \$300,000). The following income statement confirms this result; all amounts are rounded to the nearest whole dollar.

Sales revenue (8,333.33 units × \$36)	\$300,000
Total variable expenses (8,333.33 units × \$24)	(200,000)
Total contribution margin (8,333.33 units × \$12)	100,000
Fixed expenses	(60,000)
Net income	<u>\$ 40,000</u>

In practice, the company will not sell partial bottles of Delatine. The accountant rounds 8,333.33 bottles to whole units. For planning and decision making, managers frequently make decisions using approximate data. Accuracy is desirable, but it is not as important as relevance. Do not be concerned when computations do not produce whole numbers. Rounding and approximation are common characteristics of managerial accounting data.



Calculate the sales volume required to attain a target profit.



CHECK YOURSELF 11.6

VolTech Company manufactures small engines that it sells for \$130 each. Variable costs are \$70 per unit. Fixed costs are expected to be \$100,000. The management team has established a target profit of \$188,000. Use the contribution margin per unit method to determine how many engines VolTech must sell to attain the target profit.

Answer

$$\text{Sales volume in units} = \frac{\text{Fixed costs} + \text{Desired profit}}{\text{Contribution margin per unit}} = \frac{100,000 + 188,000}{\$130 - \$70} = 4,800 \text{ Units}$$

LO 8

Calculate the margin of safety in units, dollars, and percentage.

CALCULATING THE MARGIN OF SAFETY

Based on the sales records of other products, Bright Day’s marketing department believes that budgeted sales of 8,333 units is an attainable goal. Even so, the company president is concerned because Delatine is a new product and no one can be certain about how the public will react to it. He is willing to take the risk of introducing a new product that fails to produce a profit, but he does not want to take a loss on the product. He therefore focuses on the gap between the budgeted sales and the sales required to break even. The amount of this gap, called the *margin of safety*, can be measured in units or in sales dollars as shown here.

	In Units	In Dollars
Budgeted sales	8,333	\$300,000
Break-even sales	(5,000)	(180,000)
Margin of safety	<u>3,333</u>	<u>\$120,000</u>

The **margin of safety** measures the cushion between budgeted sales and the break-even point. It quantifies the amount by which actual sales can fall short of expectations before the company will begin to incur losses.

To help compare diverse products or companies of different sizes, the margin of safety can be expressed as a percentage. Divide the margin of safety by the budgeted sales volume³ as shown here.

$$\text{Margin of safety} = \frac{\text{Budgeted sales} - \text{Break-even sales}}{\text{Budgeted sales}}$$

$$\text{Margin of safety} = \frac{\$300,000 - \$180,000}{\$300,000} \times 100 = 40\%$$

This analysis suggests actual sales would have to fall short of expected sales by 40 percent before Bright Day would experience a loss on Delatine. The large margin of safety suggests the proposed advertising program to market Delatine has minimal risk.

CHECK YOURSELF 11.7

Suppose that Bright Day is considering the possibility of selling a protein supplement that will cost Bright Day \$5 per bottle. Bright Day believes that it can sell 4,000 bottles of the supplement for \$25 per bottle. Fixed costs associated with selling the supplement are expected to be \$42,000. Does the supplement have a wider margin of safety than Delatine?

Answer Calculate the break-even point for the protein supplement.

$$\text{Break-even volume in units} = \frac{\text{Fixed costs}}{\text{Contribution margin per unit}} = \frac{\$42,000}{\$25 - \$5} = 2,100 \text{ Units}$$

Calculate the margin of safety. Note that the margin of safety expressed as a percentage can be calculated using the number of units or sales dollars. Using either units or dollars yields the same percentage.

$$\text{Margin of safety} = \frac{\text{Budgeted sales} - \text{Break-even sales}}{\text{Budgeted sales}} = \frac{4,000 - 2,100}{4,000} = 47.5\%$$

The margin of safety for Delatine (40.0 percent) is below that for the protein supplement (47.5 percent). This suggests that Bright Day is more likely to incur losses selling Delatine than selling the supplement.

³The margin of safety percentage can be based on actual as well as budgeted sales. For example, an analyst could compare the margins of safety of two companies under current operating conditions by substituting actual sales for budgeted sales in the computation, as follows: $([\text{Actual sales} - \text{Break-even sales}] \div \text{Actual sales})$.

A Look Back



To plan and control business operations effectively, managers need to understand how different costs behave in relation to changes in the volume of activity. Total *fixed cost* remains constant when activity changes. Fixed cost per unit decreases with increases in activity and increases with decreases in activity. In contrast, total *variable cost* increases proportionately with increases in activity and decreases proportionately with decreases in activity. Variable cost per unit remains constant regardless of activity levels. The definitions of fixed and variable costs have meaning only within the context of a specified range of activity (the relevant range) for a defined period of time. In addition, cost behavior depends on the relevant volume measure (a store manager's salary is fixed relative to the number of customers visiting a particular store but is variable relative to the number of stores operated). A mixed cost has both fixed and variable cost components.

Fixed costs allow companies to take advantage of *operating leverage*. With operating leverage, each additional sale decreases the cost per unit. This principle allows a small percentage change in volume of revenue to cause a significantly larger percentage change in profits. The *magnitude of operating leverage* can be determined by dividing the contribution margin by net income. When all costs are fixed and revenues have covered fixed costs, each additional dollar of revenue represents pure profit. Having a fixed cost structure (employing operating leverage) offers a company both risks and rewards. If sales volume increases, fixed costs do not increase, allowing profits to soar. Alternatively, if sales volume decreases, fixed costs do not decrease and profits decline significantly more than revenues. Companies with high variable costs in relation to fixed costs do not experience as great a level of operating leverage. Their costs increase or decrease in proportion to changes in revenue. These companies face less risk but fail to reap disproportionately higher profits when volume soars.

Under the contribution margin approach, variable costs are subtracted from revenue to determine the *contribution margin*. Fixed costs are then subtracted from the contribution margin to determine net income. The contribution margin represents the amount available to pay fixed costs and provide a profit. Although not permitted by GAAP for external reporting, many companies use the contribution margin format for internal reporting purposes.

The *break-even point* (the point where total revenue equals total cost) in units can be determined by dividing fixed costs by the contribution margin per unit. The break-even point in sales dollars can be determined by multiplying the number of break-even units by the sales price per unit. To determine sales in units to obtain a designated profit, the sum of fixed costs and desired profit is divided by the contribution margin per unit.

The *margin of safety* is the number of units or the amount of sales dollars by which actual sales can fall below expected sales before a loss is incurred. The margin of safety can also be expressed as a percentage to permit comparing different size companies. The margin of safety can be computed as a percentage by dividing the difference between budgeted sales and break-even sales by the amount of budgeted sales.

A Look Forward



The next chapter begins investigating cost measurement. Accountants seek to determine the cost of certain objects. A cost object may be a product, a service, a department, a customer, or any other thing for which the cost is being determined. Some costs can be directly traced to a cost object, while others are difficult to trace. Costs that are difficult to trace to cost objects are called *indirect costs*, or *overhead*. Indirect costs are assigned to cost objects through *cost allocation*. The next chapter introduces the basic concepts and procedures of cost allocation.



A step-by-step audio-narrated series of slides is provided on the text website at www.mhhe.com/edmondssurvey3e.



SELF-STUDY REVIEW PROBLEM 1

Mensa Mountaineering Company (MMC) provides guided mountain climbing expeditions in the Rocky Mountains. Its only major expense is guide salaries; it pays each guide \$4,800 per climbing expedition. MMC charges its customers \$1,500 per expedition and expects to take five climbers on each expedition.

Part 1

Base your answers on the preceding information.

Required

- Determine the total cost of guide salaries and the cost of guide salaries per climber assuming that four, five, or six climbers are included in a trip. Relative to the number of climbers in a single expedition, is the cost of guides a fixed or a variable cost?
- Relative to the number of expeditions, is the cost of guides a fixed or a variable cost?
- Determine the profit of an expedition assuming that five climbers are included in the trip.
- Determine the profit assuming a 20 percent increase (six climbers total) in expedition revenue. What is the percentage change in profitability?
- Determine the profit assuming a 20 percent decrease (four climbers total) in expedition revenue. What is the percentage change in profitability?
- Explain why a 20 percent shift in revenue produces more than a 20 percent shift in profitability. What term describes this phenomenon?

Part 2

Assume that the guides offer to make the climbs for a percentage of expedition fees. Specifically, MMC will pay guides \$960 per climber on the expedition. Assume also that the expedition fee charged to climbers remains at \$1,500 per climber.

Required

- Determine the total cost of guide salaries and the cost of guide salaries per climber assuming that four, five, or six climbers are included in a trip. Relative to the number of climbers in a single expedition, is the cost of guides a fixed or a variable cost?
- Relative to the number of expeditions, is the cost of guides a fixed or a variable cost?
- Determine the profit of an expedition assuming that five climbers are included in the trip.
- Determine the profit assuming a 20 percent increase (six climbers total) in expedition revenue. What is the percentage change in profitability?
- Determine the profit assuming a 20 percent decrease (four climbers total) in expedition revenue. What is the percentage change in profitability?
- Explain why a 20 percent shift in revenue does not produce more than a 20 percent shift in profitability.

Solution to Part 1, Requirement a

Number of climbers (a)	4	5	6
Total cost of guide salaries (b)	\$4,800	\$4,800	\$4,800
Cost per climber (b ÷ a)	1,200	960	800

Because the total cost remains constant (fixed) regardless of the number of climbers on a particular expedition, the cost is classified as fixed. Note that the cost per climber decreases as the number of climbers increases. This is the *per unit* behavior pattern of a fixed cost.

Solution to Part 1, Requirement b

Because the total cost of guide salaries changes proportionately each time the number of expeditions increases or decreases, the cost of salaries is variable relative to the number of expeditions.

Solution to Part 1, Requirements c, d, and e

Number of Climbers	4	Percentage Change	5	Percentage Change	6
Revenue (\$1,500 per climber)	\$6,000	←(20%)←	\$7,500	⇒+20%⇒	\$9,000
Cost of guide salaries (fixed)	<u>4,800</u>		<u>4,800</u>		<u>4,800</u>
Profit	<u>\$1,200</u>	←(55.6%)←	<u>\$2,700</u>	⇒+55.6%⇒	<u>\$4,200</u>

Percentage change in revenue: $\pm \$1,500 \div \$7,500 = \pm 20\%$

Percentage change in profit: $\pm \$1,500 \div \$2,700 = \pm 55.6\%$

Solution to Part 1, Requirement f

Because the cost of guide salaries remains fixed while volume (number of climbers) changes, the change in profit, measured in absolute dollars, exactly matches the change in revenue. More specifically, each time MMC increases the number of climbers by one, revenue and profit increase by \$1,500. Because the base figure for profit (\$2,700) is lower than the base figure for revenue (\$7,500), the percentage change in profit ($\$1,500 \div \$2,700 = 55.6\%$) is higher than percentage change in revenue ($\$1,500 \div \$7,500$). This phenomenon is called *operating leverage*.

Solution for Part 2, Requirement g

Number of climbers (a)	4	5	6
Per climber cost of guide salaries (b)	\$ 960	\$ 960	\$ 960
Cost per climber (b × a)	3,840	4,800	5,760

Because the total cost changes in proportion to changes in the number of climbers, the cost is classified as variable. Note that the cost per climber remains constant (stays the same) as the number of climbers increases or decreases. This is the *per unit* behavior pattern of a variable cost.

Solution for Part 2, Requirement h

Because the total cost of guide salaries changes proportionately with changes in the number of expeditions, the cost of salaries is also variable relative to the number of expeditions.

Solution for Part 2, Requirements i, j, and k

Number of Climbers	4	Percentage Change	5	Percentage Change	6
Revenue (\$1,500 per climber)	\$6,000	←(20%)←	\$7,500	⇒+20%⇒	\$9,000
Cost of guide salaries (variable)	<u>3,840</u>		<u>4,800</u>		<u>5,760</u>
Profit	<u>\$2,160</u>	←(20%)←	<u>\$2,700</u>	⇒+20%⇒	<u>\$3,240</u>

Percentage change in revenue: $\pm \$1,500 \div \$7,500 = \pm 20\%$

Percentage change in profit: $\pm \$540 \div \$2,700 = \pm 20\%$

Solution for Part 2, Requirement l

Because the cost of guide salaries changes when volume (number of climbers) changes, the change in net income is proportionate to the change in revenue. More specifically, each time the number of climbers increases by one, revenue increases by \$1,500 and net income increases by \$540 ($\$1,500 - \960). Accordingly, the percentage change in net income will always equal the percentage change in revenue. This means that there is no operating leverage when all costs are variable.



A step-by-step audio-narrated series of slides is provided on the text website at www.mhhe.com/edmondssurvey3e.



SELF-STUDY REVIEW PROBLEM 2

Sharp Company makes and sells pencil sharpeners. The variable cost of each sharpener is \$20. The sharpeners are sold for \$30 each. Fixed operating expenses amount to \$40,000.

Required

- Determine the break-even point in units and sales dollars.
- Determine the sales volume in units and dollars that is required to attain a profit of \$12,000. Verify your answer by preparing an income statement using the contribution margin format.
- Determine the margin of safety between sales required to attain a profit of \$12,000 and break-even sales.

Solution to Requirement a

Formula for Computing Break-even Point in Units

$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit}$
 $\text{Sales price per unit (N)} - \text{Variable cost per unit (N)} - \text{Fixed costs} = \text{Profit}$
 $\text{Contribution margin per unit (N)} - \text{Fixed costs} = \text{Profit}$
 $N = (\text{Fixed costs} + \text{Profit}) \div \text{Contribution Margin per unit}$
 $N = (\$40,000 + 0) \div (\$30 - \$20) = 4,000 \text{ Units}$

Break-even Point in Sales Dollars

Sales price	\$ 30
× Number of units	<u>4,000</u>
Sales volume in dollars	<u>\$120,000</u>

Solution to Requirement b

Formula for Computing Unit Sales Required to Attain Desired Profit

$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Profit}$
 $\text{Sales price per unit (N)} - \text{Variable cost per unit (N)} - \text{Fixed costs} = \text{Profit}$
 $\text{Contribution margin per unit (N)} - \text{Fixed costs} = \text{Profit}$
 $N = (\text{Fixed costs} + \text{Profit}) \div \text{Contribution margin per unit}$
 $N = (\$40,000 + 12,000) \div (\$30 - \$20) = 5,200 \text{ Units}$

Sales Dollars Required to Attain Desired Profit

Sales price	\$ 30
× Number of units	<u>5,200</u>
Sales volume in dollars	<u>\$156,000</u>

Income Statement

Sales volume in units (a)	<u>5,200</u>
Sales revenue (a × \$30)	\$156,000
Variable costs (a × \$20)	<u>(104,000)</u>
Contribution margin	52,000
Fixed costs	<u>(40,000)</u>
Net income	<u>\$ 12,000</u>

Solution to Requirement c

Margin of Safety Computations	Units	Dollars
Budgeted sales	5,200	\$156,000
Break-even sales	(4,000)	(120,000)
Margin of safety	<u>1,200</u>	<u>\$ 36,000</u>

Percentage Computation	
$\frac{\text{Margin of safety in \$}}{\text{Budgeted sales}} = \frac{\$36,000}{\$156,000} = 23.08\%$	

KEY TERMS

Activity base 406

Break-even point 407

Contribution margin 402

Contribution margin per unit 408

Cost behavior 398

Equation method 407

Fixed cost 398

Margin of safety 410

Mixed costs (semivariable costs) 405

Operating leverage 398

Relevant range 405

Variable cost 397

QUESTIONS

- Define *fixed cost* and *variable cost* and give an example of each.
- How can knowing cost behavior relative to volume fluctuations affect decision making?
- Define the term *operating leverage* and explain how it affects profits.
- How is operating leverage calculated?
- Explain the limitations of using operating leverage to predict profitability.
- If volume is increasing, would a company benefit more from a pure variable or a pure fixed cost structure? Which cost structure would be advantageous if volume is decreasing?
- Explain the risk and rewards to a company that result from having fixed costs.
- Are companies with predominately fixed cost structures likely to be most profitable?
- How is the relevant range of activity related to fixed and variable cost? Give an example of how the definitions of these costs become invalid when volume is outside the relevant range.
- Which cost structure has the greater risk? Explain.
- The president of Bright Corporation tells you that he sees a dim future for his company. He feels that his hands are tied because fixed costs are too high. He says that fixed costs do not change and therefore the situation is hopeless. Do you agree? Explain.
- All costs are variable because if a business ceases operations, its costs fall to zero. Do you agree with the statement? Explain.
- Verna Salsbury tells you that she thinks the terms fixed cost and variable cost are confusing. She notes that fixed cost per unit changes when the number of units changes. Furthermore, variable cost per unit remains fixed regardless of how many units are produced. She concludes that the terminology seems to be backward. Explain why the terminology appears to be contradictory.
- What does the term *break-even point* mean? Name the two ways it can be measured.
- How does a contribution margin income statement differ from the income statement used in financial reporting?
- If Company A has a projected margin of safety of 22 percent while Company B has a margin of safety of 52 percent, which company is at greater risk when actual sales are less than budgeted?
- Mary Hartwell and Jane Jamail, college roommates, are considering the joint purchase of a computer that they can share to prepare class assignments. Ms. Hartwell wants a particular model that costs \$2,000; Ms. Jamail prefers a more economical model that costs \$1,500. In fact, Ms. Jamail is adamant about her position, refusing to contribute more than \$750 toward the purchase. If Ms. Hartwell is also adamant about her position, should she accept Ms. Jamail's \$750 offer and apply that amount toward the purchase of the more expensive computer?



MULTIPLE-CHOICE QUESTIONS



Multiple-choice questions are provided on the text website at www.mhhe.com/edmondssurvey3e.

EXERCISES



All applicable Exercises are available with McGraw-Hill's *Connect Accounting*.

LO 1, 5

Exercise 11-1 Identifying cost behavior

Deer Valley Kitchen, a fast-food restaurant company, operates a chain of restaurants across the nation. Each restaurant employs eight people; one is a manager who is paid a salary plus a bonus equal to 3 percent of sales. Other employees, two cooks, one dishwasher, and four waitresses, are paid salaries. Each manager is budgeted \$3,000 per month for advertising cost.

Required

Classify each of the following costs incurred by Deer Valley Kitchen as fixed, variable, or mixed.

- a. Cooks' salaries at a particular location relative to the number of customers.
- b. Cost of supplies (cups, plates, spoons, etc.) relative to the number of customers.
- c. Manager's compensation relative to the number of customers.
- d. Waitresses' salaries relative to the number of restaurants.
- e. Advertising costs relative to the number of customers for a particular restaurant.
- f. Rental costs relative to the number of restaurants.

LO 1

Exercise 11-2 Identifying cost behavior

At the various activity levels shown, Amborse Company incurred the following costs.

	Units Sold	20	40	60	80	100
a.	Depreciation cost per unit	240.00	120.00	80.00	60.00	48.00
b.	Total rent cost	3,200.00	3,200.00	3,200.00	3,200.00	3,200.00
c.	Total cost of shopping bags	2.00	4.00	6.00	8.00	10.00
d.	Cost per unit of merchandise sold	90.00	90.00	90.00	90.00	90.00
e.	Rental cost per unit of merchandise sold	36.00	18.00	12.00	9.00	7.20
f.	Total phone expense	80.00	100.00	120.00	140.00	160.00
g.	Cost per unit of supplies	1.00	1.00	1.00	1.00	1.00
h.	Total insurance cost	480.00	480.00	480.00	480.00	480.00
i.	Total salary cost	\$1,200.00	\$1,600.00	\$2,000.00	\$2,400.00	\$2,800.00
j.	Total cost of goods sold	1,800.00	3,600.00	5,400.00	7,200.00	9,000.00

Required

Identify each of these costs as fixed, variable, or mixed.

LO 1

Exercise 11-3 Determining fixed cost per unit

Henke Corporation incurs the following annual fixed costs.

Item	Cost
Depreciation	\$ 50,000
Officers' salaries	120,000
Long-term lease	51,000
Property taxes	9,000

Required

Determine the total fixed cost per unit of production, assuming that Henke produces 4,000, 4,500, or 5,000 units.

Exercise 11-4 *Determining total variable cost*

LO 1

The following variable production costs apply to goods made by Watson Manufacturing Corporation.

Item	Cost per Unit
Materials	\$5.00
Labor	2.50
Variable overhead	<u>0.25</u>
Total	<u>\$7.75</u>

Required

Determine the total variable production cost, assuming that Watson makes 5,000, 15,000, or 25,000 units.

Exercise 11-5 *Fixed versus variable cost behavior*

LO 1, 2

Robbins Company's cost and production data for two recent months included the following.

	January	February
Production (units)	100	250
Rent	\$1,500	\$1,500
Utilities	\$ 450	\$1,125



Required

- Separately calculate the rental cost per unit and the utilities cost per unit for both January and February.
- Identify which cost is variable and which is fixed. Explain your answer.

Exercise 11-6 *Fixed versus variable cost behavior*

LO 1

Lovvern Trophies makes and sells trophies it distributes to little league ballplayers. The company normally produces and sells between 8,000 and 14,000 trophies per year. The following cost data apply to various activity levels.



Number of Trophies	8,000	10,000	12,000	14,000
Total costs incurred				
Fixed	\$42,000			
Variable	42,000			
Total costs	<u>\$84,000</u>			
Cost per unit				
Fixed	\$ 5.25			
Variable	5.25			
Total cost per trophy	<u>\$10.50</u>			

Required

- a. Complete the preceding table by filling in the missing amounts for the levels of activity shown in the first row of the table. Round all cost per unit figures to the nearest whole penny.
- b. Explain why the total cost per trophy decreases as the number of trophies increases.

LO 1, 5



Exercise 11-7 Fixed versus variable cost behavior

Harrel Entertainment sponsors rock concerts. The company is considering a contract to hire a band at a cost of \$75,000 per concert.

Required

- a. What are the total band cost and the cost per person if concert attendance is 2,000, 2,500, 3,000, 3,500, or 4,000?
- b. Is the cost of hiring the band a fixed or a variable cost?
- c. Draw a graph and plot total cost and cost per unit if attendance is 2,000, 2,500, 3,000, 3,500, or 4,000.
- d. Identify Harrel’s major business risks and explain how they can be minimized.

LO 1

Exercise 11-8 Fixed versus variable cost behavior

Harrel Entertainment sells souvenir T-shirts at each rock concert that it sponsors. The shirts cost \$9 each. Any excess shirts can be returned to the manufacturer for a full refund of the purchase price. The sales price is \$15 per shirt.

Required

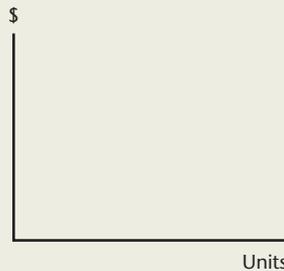
- a. What are the total cost of shirts and cost per shirt if sales amount to 2,000, 2,500, 3,000, 3,500, or 4,000?
- b. Is the cost of T-shirts a fixed or a variable cost?
- c. Draw a graph and plot total cost and cost per shirt if sales amount to 2,000, 2,500, 3,000, 3,500, or 4,000.
- d. Comment on Harrel’s likelihood of incurring a loss due to its operating activities.

LO 1

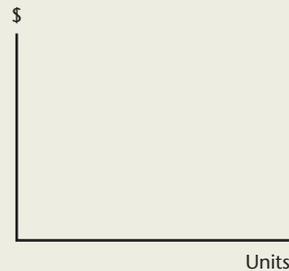
Exercise 11-9 Graphing fixed cost behavior

The following graphs depict the dollar amount of fixed cost on the vertical axes and the level of activity on the horizontal axes.

Total fixed cost



Fixed cost per unit



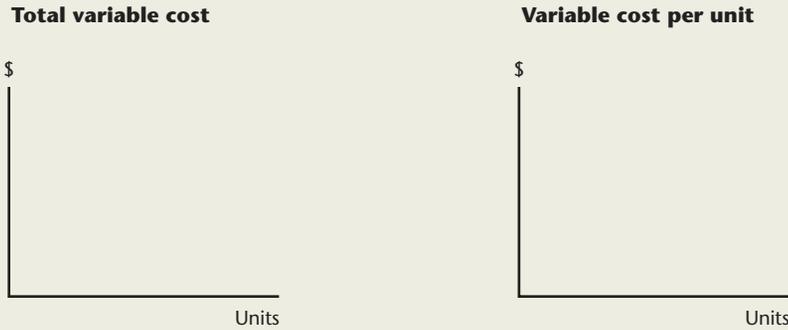
Required

- a. Draw a line that depicts the relationship between total fixed cost and the level of activity.
- b. Draw a line that depicts the relationship between fixed cost per unit and the level of activity.

Exercise 11-10 *Graphing variable cost behavior*

LO 1

The following graphs depict the dollar amount of variable cost on the vertical axes and the level of activity on the horizontal axes.



Required

- a. Draw a line that depicts the relationship between total variable cost and the level of activity.
- b. Draw a line that depicts the relationship between variable cost per unit and the level of activity.

Exercise 11-11 *Mixed cost at different levels of activity*

LO 1

Omar Corporation paid one of its sales representatives \$4,300 during the month of March. The rep is paid a base salary plus \$15 per unit of product sold. During March, the rep sold 200 units.

Required

Calculate the total monthly cost of the sales representative’s salary for each of the following months.

Month	April	May	June	July
Number of units sold	240	150	250	160
Total variable cost				
Total fixed cost				
Total salary cost				

Exercise 11-12 *Using fixed cost as a competitive business strategy*

LO 1, 2

The following income statements illustrate different cost structures for two competing companies.



Income Statements		
	Company Name	
	Hank	Rank
Number of customers (a)	80	80
Sales revenue (a × \$250)	\$20,000	\$20,000
Variable cost (a × \$175)	N/A	(14,000)
Variable cost (a × \$0)	0	N/A
Contribution margin	20,000	6,000
Fixed cost	(14,000)	0
Net income	<u>\$ 6,000</u>	<u>\$ 6,000</u>

Required

- Reconstruct Hank's income statement, assuming that it serves 160 customers when it lures 80 customers away from Rank by lowering the sales price to \$150 per customer.
- Reconstruct Rank's income statement, assuming that it serves 160 customers when it lures 80 customers away from Hank by lowering the sales price to \$150 per customer.
- Explain why the price-cutting strategy increased Hank Company's profits but caused a net loss for Rank Company.

LO 3, 4**Exercise 11-13** *Using a contribution margin format income statement to measure the magnitude of operating leverage*

The following income statement was drawn from the records of Ulrich Company, a merchandising firm.

ULRICH COMPANY	
Income Statement	
For the Year Ended December 31, 2011	
Sales revenue (4,000 units × \$150)	\$600,000
Cost of goods sold (4,000 units × \$80)	(320,000)
Gross margin	280,000
Sales commissions (10% of sales)	(60,000)
Administrative salaries expense	(90,000)
Advertising expense	(40,000)
Depreciation expense	(50,000)
Shipping and handling expenses (4,000 units × \$1)	(4,000)
Net income	<u>\$ 36,000</u>

Required

- Reconstruct the income statement using the contribution margin format.
- Calculate the magnitude of operating leverage.
- Use the measure of operating leverage to determine the amount of net income Ulrich will earn if sales increase by 10 percent.

LO 4**Exercise 11-14** *Assessing the magnitude of operating leverage*

The following income statement applies to Stuart Company for the current year.

Income Statement	
Sales revenue (400 units × \$25)	\$10,000
Variable cost (400 units × \$10)	(4,000)
Contribution margin	6,000
Fixed costs	(3,500)
Net income	<u>\$2,500</u>

Required

- Use the contribution margin approach to calculate the magnitude of operating leverage.
- Use the operating leverage measure computed in Requirement *a* to determine the amount of net income that Stuart Company will earn if it experiences a 10 percent increase in revenue. The sales price per unit is not affected.
- Verify your answer to Requirement *b* by constructing an income statement based on a 10 percent increase in sales revenue. The sales price is not affected. Calculate the percentage change in net income for the two income statements.

Exercise 11-15 *Break-even point*

LO 6

Connor Corporation sells products for \$25 each that have variable costs of \$13 per unit. Connor's annual fixed cost is \$264,000.

Required

Determine the break-even point in units and dollars.

Exercise 11-16 *Desired profit*

LO 7

Garcia Company incurs annual fixed costs of \$60,000. Variable costs for Garcia's product are \$22.75 per unit, and the sales price is \$35.00 per unit. Garcia desires to earn an annual profit of \$45,000.

Required

Determine the sales volume in dollars and units required to earn the desired profit.

Exercise 11-17 *Determining fixed and variable cost per unit*

LO 1

Landry Corporation produced and sold 12,000 units of product during October. It earned a contribution margin of \$96,000 on sales of \$336,000 and determined that cost per unit of product was \$25.

Required

Based on this information, determine the variable and fixed cost per unit of product.

Exercise 11-18 *Determining variable cost from incomplete cost data*

LO 1

Laya Corporation produced 200,000 watches that it sold for \$16 each during 2012. The company determined that fixed manufacturing cost per unit was \$7 per watch. The company reported a \$800,000 gross margin on its 2011 financial statements.

Required

Determine the total variable cost, the variable cost per unit, and the total contribution margin.

Exercise 11-19 *Margin of safety*

LO 6, 7, 8

Information concerning a product produced by Askew Company appears here.

Sales price per unit	\$145
Variable cost per unit	\$55
Total annual fixed manufacturing and operating costs	\$810,000

Required

Determine the following.

- Contribution margin per unit.
- Number of units that Askew must sell to break even.
- Sales level in units that Askew must reach to earn a profit of \$360,000.
- Determine the margin of safety in units, sales dollars, and as a percentage.

Exercise 11-20 *Margin of safety*

LO 8

Jensen Company makes a product that sells for \$38 per unit. The company pays \$16 per unit for the variable costs of the product and incurs annual fixed costs of \$176,000. Jensen expects to sell 21,000 units of product.

Required

Determine Jensen's margin of safety in units, sales dollars, and as a percentage.


LO 1, 5
PROBLEMS

All applicable Problems are available with McGraw-Hill's Connect Accounting.

Problem 11-21 Identifying cost behavior
Required

Identify the following costs as fixed or variable.

Costs related to plane trips between Seattle, Washington, and Orlando, Florida, follow. Pilots are paid on a per trip basis.

- Pilots' salaries relative to the number of trips flown.
- Depreciation relative to the number of planes in service.
- Cost of refreshments relative to the number of passengers.
- Pilots' salaries relative to the number of passengers on a particular trip.
- Cost of a maintenance check relative to the number of passengers on a particular trip.
- Fuel costs relative to the number of trips.

First Federal Bank operates several branch offices in grocery stores. Each branch employs a supervisor and two tellers.

- Tellers' salaries relative to the number of tellers in a particular district.
- Supplies cost relative to the number of transactions processed in a particular branch.
- Tellers' salaries relative to the number of customers served at a particular branch.
- Supervisors' salaries relative to the number of branches operated.
- Supervisors' salaries relative to the number of customers served in a particular branch.
- Facility rental costs relative to the size of customer deposits.

Costs related to operating a fast-food restaurant follow.

- Depreciation of equipment relative to the number of restaurants.
- Building rental cost relative to the number of customers served in a particular restaurant.
- Manager's salary of a particular restaurant relative to the number of employees.
- Food cost relative to the number of customers.
- Utility cost relative to the number of restaurants in operation.
- Company president's salary relative to the number of restaurants in operation.
- Land costs relative to the number of hamburgers sold at a particular restaurant.
- Depreciation of equipment relative to the number of customers served at a particular restaurant.

LO 1, 6

CHECK FIGURES

- Total supplies cost for cleaning 30 houses: \$180
- Total cost for 20 houses: \$2,370

Problem 11-22 Cost behavior and averaging

Carlia Weaver has decided to start Carlia Cleaning, a residential house cleaning service company. She is able to rent cleaning equipment at a cost of \$750 per month. Labor costs are expected to be \$75 per house cleaned and supplies are expected to cost \$6 per house.

Required

- Determine the total expected cost of equipment rental and the expected cost of equipment rental per house cleaned, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month. Is the cost of equipment a fixed or a variable cost?
- Determine the total expected cost of labor and the expected cost of labor per house cleaned, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month. Is the cost of labor a fixed or a variable cost?
- Determine the total expected cost of supplies and the expected cost of supplies per house cleaned, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month. Is the cost of supplies a fixed or a variable cost?
- Determine the total expected cost of cleaning houses, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month.

- e. Determine the expected cost per house, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month. Why does the cost per unit decrease as the number of houses increases?
- f. If Ms. Weaver tells you that she prices her services at 25% above cost, would you assume that she means average or actual cost? Why?

Problem 11-23 *Context-sensitive nature of cost behavior classifications*

LO 5



Pacific Bank’s start-up division establishes new branch banks. Each branch opens with three tellers. Total teller cost per branch is \$90,000 per year. The three tellers combined can process up to 90,000 customer transactions per year. If a branch does not attain a volume of at least 60,000 transactions during its first year of operations, it is closed. If the demand for services exceeds 90,000 transactions, an additional teller is hired, and the branch is transferred from the start-up division to regular operations.

CHECK FIGURE

- b. Average teller cost for 60,000 transactions: \$1.50

Required

- a. What is the relevant range of activity for new branch banks?
- b. Determine the amount of teller cost in total and the teller cost per transaction for a branch that processes 60,000, 70,000, 80,000, or 90,000 transactions. In this case (the activity base is the number of transactions for a specific branch), is the teller cost a fixed or a variable cost?
- c. Determine the amount of teller cost in total and the teller cost per branch for Pacific Bank, assuming that the start-up division operates 10, 15, 20, or 25 branches. In this case (the activity base is the number of branches), is the teller cost a fixed or a variable cost?

Problem 11-24 *Context-sensitive nature of cost behavior classifications*

LO 5



Susan Hicks operates a sales booth in computer software trade shows, selling an accounting software package, *Dollar System*. She purchases the package from a software manufacturer for \$175 each. Booth space at the convention hall costs \$10,000 per show.

CHECK FIGURES

- a. Average cost at 400 units: \$200
- b. Average price at 250 units: \$265

Required

- a. Sales at past trade shows have ranged between 200 and 400 software packages per show. Determine the average cost of sales per unit if Ms. Hicks sells 200, 250, 300, 350, or 400 units of *Dollar System* at a trade show. Use the following chart to organize your answer. Is the cost of booth space fixed or variable?

	Sales Volume in Units (a)				
	200	250	300	350	400
Total cost of software (a × \$175)	\$35,000				
Total cost of booth rental	10,000				
Total cost of sales (b)	\$45,000				
Average cost per unit (b ÷ a)	\$ 225				

- b. If Ms. Hicks wants to earn a \$50 profit on each package of software she sells at a trade show, what price must she charge at sales volumes of 200, 250, 300, 350, or 400 units?
- c. Record the total cost of booth space if Ms. Hicks attends one, two, three, four, or five trade shows. Record your answers in the following chart. Is the cost of booth space fixed or variable relative to the number of shows attended?

	Number of Trade Shows Attended				
	1	2	3	4	5
Total cost of booth rental	\$10,000				

- d. Ms. Hicks provides decorative shopping bags to customers who purchase software packages. Some customers take the bags; others do not. Some customers stuff more than one software package into a single bag. The number of bags varies in relation to the number of units sold, but the relationship is not proportional. Assume that Ms. Hicks uses \$30 of bags for every 50 software packages sold. What is the additional cost per unit sold? Is the cost fixed or variable?

LO 1, 2**CHECK FIGURES**

Part 1, b: \$2,200

Part 2, h: \$3,000 & 10%

Part 3, k: cost per student for 22 students: \$25

**Problem 11-25** *Effects of operating leverage on profitability*

Webster Training Services (WTS) provides instruction on the use of computer software for the employees of its corporate clients. It offers courses in the clients' offices on the clients' equipment. The only major expense WTS incurs is instructor salaries; it pays instructors \$5,000 per course taught. WTS recently agreed to offer a course of instruction to the employees of Chambers Incorporated at a price of \$400 per student. Chambers estimated that 20 students would attend the course.

Base your answer on the preceding information.

Part 1:**Required**

- Relative to the number of students in a single course, is the cost of instruction a fixed or a variable cost?
- Determine the profit, assuming that 20 students attend the course.
- Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 22 students). What is the percentage change in profitability?
- Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 18 students). What is the percentage change in profitability?
- Explain why a 10 percent shift in enrollment produces more than a 10 percent shift in profitability. Use the term that identifies this phenomenon.

Part 2:

The instructor has offered to teach the course for a percentage of tuition fees. Specifically, she wants \$250 per person attending the class. Assume that the tuition fee remains at \$400 per student.

Required

- Is the cost of instruction a fixed or a variable cost?
- Determine the profit, assuming that 20 students take the course.
- Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 22 students). What is the percentage change in profitability?
- Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 18 students). What is the percentage change in profitability?
- Explain why a 10 percent shift in enrollment produces a proportional 10 percent shift in profitability.

Part 3:

WTS sells a workbook with printed material unique to each course to each student who attends the course. Any workbooks that are not sold must be destroyed. Prior to the first class, WTS printed 20 copies of the books based on the client's estimate of the number of people who would attend the course. Each workbook costs \$25 and is sold to course participants for \$40. This cost includes a royalty fee paid to the author and the cost of duplication.

Required

- Calculate the workbook cost in total and per student, assuming that 18, 20, or 22 students attempt to attend the course.
 - Classify the cost of workbooks as fixed or variable relative to the number of students attending the course.
- Discuss the risk of holding inventory as it applies to the workbooks.
- Explain how a just-in-time inventory system can reduce the cost and risk of holding inventory.



Problem 11-26 *Effects of fixed and variable cost behavior on the risk and rewards of business opportunities*

LO 1, 2



Eastern and Western Universities offer executive training courses to corporate clients. Eastern pays its instructors \$5,310 per course taught. Western pays its instructors \$295 per student enrolled in the class. Both universities charge executives a \$340 tuition fee per course attended.

CHECK FIGURES

- a. Western NI: \$810
- b. NI: \$2,610

Required

- a. Prepare income statements for Eastern and Western, assuming that 18 students attend a course.
- b. Eastern University embarks on a strategy to entice students from Western University by lowering its tuition to \$220 per course. Prepare an income statement for Eastern, assuming that the university is successful and enrolls 36 students in its course.
- c. Western University embarks on a strategy to entice students from Eastern University by lowering its tuition to \$220 per course. Prepare an income statement for Western, assuming that the university is successful and enrolls 36 students in its course.
- d. Explain why the strategy described in Requirement *b* produced a profit but the same strategy described in Requirement *c* produced a loss.
- e. Prepare income statements for Eastern and Western Universities, assuming that 15 students attend a course, assuming that both universities charge executives a \$340 tuition fee per course attended.
- f. It is always better to have fixed than variable cost. Explain why this statement is false.
- g. It is always better to have variable than fixed cost. Explain why this statement is false.

Problem 11-27 *Analyzing operating leverage*

LO 3, 4



Justin Zinder is a venture capitalist facing two alternative investment opportunities. He intends to invest \$1 million in a start-up firm. He is nervous, however, about future economic volatility. He asks you to analyze the following financial data for the past year's operations of the two firms he is considering and give him some business advice.

	Company Name	
	Ensley	Kelley
Variable cost per unit (a)	\$21.00	\$10.50
Sales revenue (8,000 units × \$28)	\$224,000	\$224,000
Variable cost (8,000 units × a)	(168,000)	(84,000)
Contribution margin	56,000	140,000
Fixed cost	(25,000)	(109,000)
Net income	<u>\$ 31,000</u>	<u>\$ 31,000</u>

CHECK FIGURES

- b. % of change for Kelley: 45.16
- c. % of change for Ensley: (18.06)

Required

- a. Use the contribution margin approach to compute the operating leverage for each firm.
- b. If the economy expands in coming years, Ensley and Kelley will both enjoy a 10 percent per year increase in sales, assuming that the selling price remains unchanged. Compute the change in net income for each firm in dollar amount and in percentage. (*Note:* Because the number of units increases, both revenue and variable cost will increase.)
- c. If the economy contracts in coming years, Ensley and Kelley will both suffer a 10 percent decrease in sales volume, assuming that the selling price remains unchanged. Compute the change in net income for each firm in dollar amount and in percentage. (*Note:* Because the number of units decreases, both total revenue and total variable cost will decrease.)
- d. Write a memo to Justin Zinder with your analyses and advice.

Problem 11-28 *Determining the break-even point and preparing a contribution margin income statement*

LO 3, 6



Inman Manufacturing Company makes a product that it sells for \$60 per unit. The company incurs variable manufacturing costs of \$24 per unit. Variable selling expenses are \$12 per unit, annual fixed manufacturing costs are \$189,000, and fixed selling and administrative costs are \$141,000 per year.

CHECK FIGURE

- a. 13,750 units

Required

Determine the break-even point in units and dollars using the following approaches.

- Equation method.
- Contribution margin per unit.
- Contribution margin ratio.
- Confirm your results by preparing a contribution margin income statement for the break-even sales volume.

LO 8**Problem 11-29** *Margin of safety and operating leverage*

Santiago Company is considering the addition of a new product to its cosmetics line. The company has three distinctly different options: a skin cream, a bath oil, or a hair coloring gel. Relevant information and budgeted annual income statements for each of the products follow.

CHECK FIGURES

b. NI:

Skin Cream	\$60,000
Bath Oil	\$60,000
Color Gel	\$40,000

	Relevant Information		
	Skin Cream	Bath Oil	Color Gel
Budgeted sales in units (a)	50,000	90,000	30,000
Expected sales price (b)	\$7.00	\$4.00	\$13.00
Variable costs per unit (c)	\$4.00	\$1.50	\$ 9.00
Income Statements			
Sales revenue (a × b)	\$350,000	\$360,000	\$390,000
Variable costs (a × c)	(200,000)	(135,000)	(270,000)
Contribution margin	150,000	225,000	120,000
Fixed costs	(120,000)	(210,000)	(104,000)
Net income	<u>\$ 30,000</u>	<u>\$ 15,000</u>	<u>\$ 16,000</u>

Required

- Determine the margin of safety as a percentage for each product.
- Prepare revised income statements for each product, assuming a 20 percent increase in the budgeted sales volume.
- For each product, determine the percentage change in net income that results from the 20 percent increase in sales. Which product has the highest operating leverage?
- Assuming that management is pessimistic and risk averse, which product should the company add to its cosmetic line? Explain your answer.
- Assuming that management is optimistic and risk aggressive, which product should the company add to its cosmetics line? Explain your answer.

ANALYZE, THINK, COMMUNICATE**ATC 11-1** *Business Applications* *Operating leverage***Description of Business for Amazon.com, Inc.**

Amazon.com opened its virtual doors on the World Wide Web in July 1995 and we offer Earth's Biggest Selection. We seek to be Earth's most customer-centric company for three primary customer sets: consumer customers, seller customers and developer customers. In addition, we generate revenue through co-branded credit card agreements and other marketing and promotional services, such as online advertising.



Amazon.com	2008	2007
Operating revenue	\$19,166	\$14,835
Operating earnings	842	655

Description of Business for CSX, Inc.

CSX Corporations (“CSX”) together with its subsidiaries (the “Company”), based in Jacksonville, Florida, is one of the nation’s leading transportation suppliers. The Company’s rail and intermodal businesses provide rail-based transportation services including traditional rail service and the transport of intermodal containers and trailers.

CSX, Inc.	2008	2007
Operating revenue	\$11,255	\$10,030
Operating earnings	2,768	2,260

Required

- Determine which company appears to have the higher operating leverage.
- Write a paragraph or two explaining why the company you identified in Requirement *a* might be expected to have the higher operating leverage.
- If revenues for both companies declined, which company do you think would likely experience the greater decline in operating earnings? Explain your answer.

ATC 11-2 Group Assignment *Operating leverage*

The Parent Teacher Association (PTA) of Meadow High School is planning a fund-raising campaign. The PTA is considering the possibility of hiring Eric Logan, a world-renowned investment counselor, to address the public. Tickets would sell for \$28 each. The school has agreed to let the PTA use Harville Auditorium at no cost. Mr. Logan is willing to accept one of two compensation arrangements. He will sign an agreement to receive a fixed fee of \$10,000 regardless of the number of tickets sold. Alternatively, he will accept payment of \$20 per ticket sold. In communities similar to that in which Meadow is located, Mr. Logan has drawn an audience of approximately 500 people.



Required

- In front of the class, present a statement showing the expected net income assuming 500 people buy tickets.
- Divide the class into groups and then organize the groups into four sections. Assign one of the following tasks to each section of groups.

Group Tasks

- Assume the PTA pays Mr. Logan a fixed fee of \$10,000. Determine the amount of net income that the PTA will earn if ticket sales are 10 percent higher than expected. Calculate the percentage change in net income.
 - Assume that the PTA pays Mr. Logan a fixed fee of \$10,000. Determine the amount of net income that the PTA will earn if ticket sales are 10 percent lower than expected. Calculate the percentage change in net income.
 - Assume that the PTA pays Mr. Logan \$20 per ticket sold. Determine the amount of net income that the PTA will earn if ticket sales are 10 percent higher than expected. Calculate the percentage change in net income.
 - Assume that the PTA pays Mr. Logan \$20 per ticket sold. Determine the amount of net income that the PTA will earn if ticket sales are 10 percent lower than expected. Calculate the percentage change in net income.
- Have each group select a spokesperson. Have one of the spokespersons in each section of groups go to the board and present the results of the analysis conducted in Requirement *b*. Resolve any discrepancies in the computations presented at the board and those developed by the other groups.
 - Draw conclusions regarding the risks and rewards associated with operating leverage. At a minimum, answer the following questions.
 - Which type of cost structure (fixed or variable) produces the higher growth potential in profitability for a company?

- (2) Which type of cost structure (fixed or variable) produces the higher risk of declining profitability for a company?
- (3) Under what circumstances should a company seek to establish a fixed cost structure?
- (4) Under what circumstances should a company seek to establish a variable cost structure?



ATC 11-3 Research Assignment *Fixed versus variable cost*

Use the 2008 Form 10-K for **Black & Decker Corp.** (B&D) to complete the requirements below. To obtain the Form 10-K you can use the EDGAR system following the instructions in Appendix A, or it can be found under “Investor Relations” on the company’s corporate website: www.bdk.com. Be sure to read carefully the following portions of the document.

- “General Development of the Business” on page 1.
- “Consolidated Statement of Earnings” on page 36.

Required

- a. Calculate the percentage decrease in B&D’s sales and its “operating income” from 2007 to 2008.
- b. Would fixed costs or variable costs be more likely to explain why B&D’s operating earnings decreased by a bigger percentage than its sales?
- c. On page 42 B&D reported that it incurred product development costs of \$146 million in 2008. If this cost is thought of in the context of the number of units of products sold, should it be considered as primarily fixed or variable in nature?
- d. If the product development costs are thought of in the context of the number of new products developed, should it be considered as primarily fixed or variable in nature?

ATC 11-4 Writing Assignment *Operating leverage, margin of safety, and cost behavior*



In the early years of the 21st century the housing market in the United States was booming. Housing prices were increasing rapidly, new houses were being constructed at a record pace, and companies doing business in the construction and home improvement industry were enjoying rising profits. In 2006 the real estate market had slowed considerably, and the slump continued through 2007.

Home Depot was one major company in the building supplies industry that was adversely affected by the slowdown in the housing market. On August 14, 2007, it announced that its revenues for the first half of the year were 3 percent lower than revenues were for the first six months of 2006. Of even greater concern was the fact that its earnings for the first half of 2007 were 21 percent lower than for the same period in the prior year.

Required

Write a memorandum that explains how a 3 percent decline in sales could cause a 21 percent decline in profits. Your memo should address the following:

- a. An identification of the accounting concept involved.
- b. A discussion of how various major types of costs incurred by Home Depot were likely affected by the decline in its sales.
- c. The effect of the decline in sales on Home Depot’s margin of safety.

ATC 11-5 Ethical Dilemma *Profitability versus social conscience (effects of cost behavior)*



Advances in biological technology have enabled two research companies, Bio Labs Inc. and Scientific Associates, to develop an insect-resistant corn seed. Neither company is financially strong enough to develop the distribution channels necessary to bring the product to world markets. World Agra Distributors Inc. has negotiated contracts with both companies for the exclusive right to market their seed. Bio Labs signed an agreement to receive an annual royalty of \$1,000,000. In contrast, Scientific Associates chose an agreement that provides for a royalty of \$0.50 per pound of seed sold. Both agreements have a 10-year term. During 2010, World Agra sold approximately 1,600,000 pounds of the Bio Labs Inc. seed and 2,400,000 pounds of the Scientific Associates seed. Both types of seed were sold for \$1.25 per pound. By the end of 2010,

it was apparent that the seed developed by Scientific Associates was superior. Although insect infestation was virtually nonexistent for both types of seed, the seed developed by Scientific Associates produced corn that was sweeter and had consistently higher yields.

World Agra Distributors' chief financial officer, Roger Weatherstone, recently retired. To the astonishment of the annual planning committee, Mr. Weatherstone's replacement, Ray Borrough, adamantly recommended that the marketing department develop a major advertising campaign to promote the seed developed by Bio Labs Inc. The planning committee reluctantly approved the recommendation. A \$100,000 ad campaign was launched; the ads emphasized the ability of the Bio Labs seed to avoid insect infestation. The campaign was silent with respect to taste or crop yield. It did not mention the seed developed by Scientific Associates. World Agra's sales staff was instructed to push the Bio Labs seed and to sell the Scientific Associates seed only on customer demand. Although total sales remained relatively constant during 2011, sales of the Scientific Associates seed fell to approximately 1,300,000 pounds while sales of the Bio Labs Inc. seed rose to 2,700,000 pounds.

Required

- a. Determine the amount of increase or decrease in profitability experienced by World Agra in 2011 as a result of promoting Bio Labs seed. Support your answer with appropriate commentary.
- b. Did World Agra's customers in particular and society in general benefit or suffer from the decision to promote the Bio Labs seed?
- c. Review the standards of ethical conduct in Exhibit 10.17 of Chapter 10 and comment on whether Mr. Borrough's recommendation violated any of the principles in the Statement of Ethical Professional Practice.
- d. Comment on your belief regarding the adequacy of the Statement of Ethical Professional Practice for Managerial Accountants to direct the conduct of management accountants.