CHAPTER 2

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 Select an appropriate time period for calculating the average cost per unit.

7 Use the high-low method, scattergraphs, and regression analysis to estimate fixed and variable costs.

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 60.)

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FIXED 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 2.1 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 2.2.

EXHIBIT 2.1

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 2.2

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 2.1 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 2.1 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

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 2.3.

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 2.3

Operating Leverage
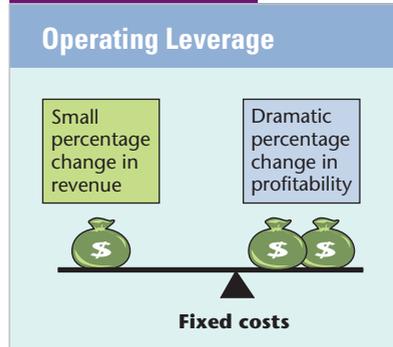
FOCUS ON INTERNATIONAL ISSUES

FIXED COSTS BRING INTERNATIONAL INTRIGUE INTO THE AUTOMOBILE INDUSTRY

The major advantage of fixed costs is that as output increases, cost per unit decreases. Of course fixed costs can be a disadvantage if output is falling. Due to the nature of the industry automobile manufacturers have high fixed costs. It takes a lot of land, buildings, and machinery to mass produce cars and trucks.

In 2007 the worldwide production of autos was 73.3 million units;* in 2008 it had fallen to 70.5 million units due to the global recession. Not surprisingly, this had an adverse effect on companies that were already struggling, such as **GM**, **Ford**, and **Chrysler**, but it also affected the strongest company in the industry, Toyota. In its fiscal year ended March 31, 2008, Toyota produced 8.5 million vehicles and had a profit of $17.1 billion. In its fiscal year ended March 31, 2009, the company's output had fallen to 7.1 million vehicles, and it had a *net loss* of $4.0 billion.

A company with high fixed costs suffers on two fronts during a recession. First, the lower production causes its cost per unit to rise. Second, the weak economy puts pressure on it, and its competitors, to lower prices, or at least not to raise them. In **Toyota**'s case, this meant that a company that had been reporting growing profits for many years suddenly had a significant loss.

*Sources of data: International Organization of Motor Vehicle Manufactures and Toyota's annual reports.

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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 2.4 to verify this result.[1]

EXHIBIT 2.4

Effect of Operating Leverage on Profitability

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

Calculating Percentage Change

The percentages in Exhibit 2.4 are computed as follows:

(Alternative measure − Base measure) ÷ Base measure = % 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).

(Alternative measure − Base measure) ÷ Base measure = % change

($11,400 − $6,000) ÷ $6,000 = 90%

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[1]Do 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:

(Alternative measure − Base measure) ÷ Base measure = % change

($600 − $6,000) ÷ $6,000 = (90%)

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.*

VARIABLE COST BEHAVIOR

LO 1

Identify and describe fixed, variable, and mixed 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 2.5 shows the total cost of the band and the cost per ticket sold at three different levels of activity.

EXHIBIT 2.5

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

Since 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 2.6.

EXHIBIT 2.6

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

LO 2

Demonstrate the effects of operating leverage on profitability.

Shifting the cost structure from fixed to variable enables SPI to avoid the fixed-cost risk. Recall that under the fixed cost structure, SPI was locked into a $48,000 cost for the band regardless of how many tickets are sold. If no tickets are sold, SPI will have to report a $48,000 loss on its income statement. The risk of incurring this loss is eliminated by the variable cost structure that requires SPI to only pay the band $16 per ticket sold. If SPI sells zero tickets then the cost of the band is zero. For each ticket sold, SPI earns a $2 profit ($18 ticket sales price − $16 fee paid to band).

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 2.7 shows

EXHIBIT 2.7

Variable Cost Eliminates Operating Leverage

Number of tickets sold	2,700	⟸−10%⟸	3,000	⟹+10%⟹	3,300
Sales revenue ($18 per ticket)	$48,600		$54,000		$59,400
Cost of band ($16 variable cost)	(43,200)		(48,000)		(52,800)
Gross margin	$ 5,400	⟸−10%⟸	$ 6,000	⟹+10%⟹	$ 6,600

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. While the variable cost structure reduces risk, Exhibit 2.7 demonstrates that it also limits the opportunity to benefit from operating leverage.

The risk versus reward trade-off of cost structure is widespread in business practice. For example, borrowing money to buy an office building may require a company to commit to a fixed monthly principal and interest payment. If the company's revenue stream unexpectedly declines, the company still has to make its monthly payment. Indeed, many companies are forced into bankruptcy because they cannot satisfy their fixed debt commitments. Many companies avoid these fixed cost risks by renting their office space instead of purchasing buildings. If revenue dips, the company simply reduces the amount of office space it rents, thereby reducing its rental cost. Other real-world examples of fixed-cost risk avoidance include using temporary employees instead of hiring for permanent positions and paying a variable retainer fee to an independent law firm instead of creating a legal department within the company. These examples demonstrate the widespread applicability of the trade-offs associated with cost structure. Managers continually apply professional judgment to assess the risks of locking in costs with the opportunities provided by operating leverage.

✓ CHECK YOURSELF 2.1

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.

EFFECT OF COST STRUCTURE ON PROFIT STABILITY

The preceding discussion suggests that companies with higher levels of fixed costs are more likely to experience earnings volatility. To illustrate, suppose three companies produce and sell the same product. Each company sells 10 units for $10 each. Furthermore, each company incurs costs of $60 in the process of making and selling its products. However, the companies operate under radically different **cost structures.** The entire $60 of cost incurred by Company A is fixed. Company B incurs $30 of fixed cost and $30 of variable cost ($3 per unit). All $60 of cost incurred by Company C is variable ($6 per unit). Exhibit 2.8 displays income statements for the three companies.

LO 2

Demonstrate the effects of operating leverage on profitability.

EXHIBIT 2.8

Income Statements

	Company Name		
	A	**B**	**C**
Variable cost per unit (a)	$ 0	$ 3	$ 6
Sales revenue (10 units × $10)	$100	$100	$100
Variable cost (10 units × a)	0	(30)	(60)
Fixed cost	(60)	(30)	0
Net income	$ 40	$ 40	$ 40

EXHIBIT 2.9

Income Statements

	Company Name		
	A	**B**	**C**
Variable cost per unit (a)	$ 0	$ 3	$ 6
Sales revenue (11 units × $10)	$110	$110	$110
Variable cost (11 units × a)	0	(33)	(66)
Fixed cost	(60)	(30)	0
Net income	$ 50	$ 47	$ 44

When sales change, the amount of the corresponding change in net income is directly influenced by the company's cost structure. The more fixed cost, the greater the fluctuation in net income. To illustrate, assume sales increase by one unit; the resulting income statements are displayed in Exhibit 2.9.

Company A, with the highest level of fixed costs, experienced a $10 ($50 − $40) increase in profitability; Company C, with the lowest level of fixed cost (zero), had only a $4 ($44 − $40) increase in profitability. Company B, with a 50/50 mix of fixed and variable cost, had a mid-range $7 ($47 − $40) increase in net income. The effect of fixed cost on volatility applies to decreases as well as increases in sales volume. To illustrate, assume sales decrease by one unit (from 10 to 9 units). The resulting income statements are displayed in Exhibit 2.10.

Company A again experiences the largest variance in earnings ($10 decrease). Company B had a moderate decline of $7, and Company C had the least volatility with only a $4 decline.

What cost structure is the best? Should a manager use fixed or variable costs? The answer depends on sales volume expectations. A manager who expects revenues to increase should use a fixed cost structure. On the other hand, if future sales growth is uncertain or if the manager believes revenue is likely to decline, a variable cost structure makes more sense.

EXHIBIT 2.10

Income Statements

	Company Name		
	A	**B**	**C**
Variable cost per unit (a)	$ 0	$ 3	$ 6
Sales revenue (9 units × $10)	$90	$90	$90
Variable cost (9 units × a)	0	(27)	(54)
Fixed cost	(60)	(30)	0
Net income	$30	$33	$36

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. Chapter 3 will investigate the relationships among an entity's cost structure, output level, pricing strategy, and profits earned in more depth.

✓ **CHECK YOURSELF 2.2**

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

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 2.11 illustrates income statements prepared using the contribution margin approach.

LO 3

Prepare an income statement using the contribution margin approach.

EXHIBIT 2.11

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	$ 20	$ 20

USING FIXED COST TO PROVIDE A COMPETITIVE OPERATING ADVANTAGE

Mary MaHall and John Strike have established tutoring companies to support themselves while they attend college. Both Ms. MaHall and Mr. Strike function as owner/managers; they each hire other students to actually provide the tutoring services. Ms. MaHall pays her tutors salaries; her labor costs are fixed at $16,000 per year regardless of the number of hours of tutoring performed. Mr. Strike pays his employees $8 per hour; his labor is therefore a variable cost. Both businesses currently provide 2,000 hours of tutoring services at a price of $11 per hour. As shown in Exhibit 2.12, both companies currently produce the same profit.

     Suppose Ms. MaHall adopts a strategy to win over Mr. Strike's customers by reducing the price of tutoring services from $11 per hour to $7 per hour. If Ms. MaHall

LO 2

Demonstrate the effects of operating leverage on profitability.

EXHIBIT 2.12

Comparative Profitability at 2,000 Hours of Tutoring

		MaHall		Strike
Number of hours of tutoring provided		2,000		2,000
Service revenue ($11 per hour)		$22,000		$22,000
Cost of tutors	Fixed	(16,000)	Variable ($8 × 2,000)	(16,000)
Net income		$ 6,000		$ 6,000

succeeds, her company's income will double as shown in Exhibit 2.13. Mr. Strike is in a vulnerable position because if he matches MaHall's price cut he will lose $1 ($7 new per-hour price − $8 cost per hour for tutor) for each hour of tutoring service that his company provides.

EXHIBIT 2.13

MaHall's Profitability at 4,000 Hours of Tutoring

		MaHall
Number of hours of tutoring provided		4,000
Service revenue ($7 per hour)		$28,000
Cost of tutors	Fixed	(16,000)
Net income (loss)		$12,000

Is Mr. Strike's business doomed? Not necessarily; Ms. MaHall's operating leverage strategy only works if volume increases. If Mr. Strike matches Ms. MaHall's price, thereby maintaining the existing sales volume levels between the two companies, both companies incur losses. Exhibit 2.14 verifies this conclusion. Under these circumstances, Ms. MaHall would be forced to raise her price or to face the same negative consequences that she is attempting to force on Mr. Strike.

EXHIBIT 2.14

Comparative Profitability at 2,000 Hours of Tutoring

		MaHall		Strike
Number of hours of tutoring provided		2,000		2,000
Service revenue ($7 per hour)		$14,000		$14,000
Cost of tutors	Fixed	(16,000)	Variable ($8 × 2,000)	(16,000)
Net income (loss)		$(2,000)		$(2,000)

MEASURING OPERATING LEVERAGE USING CONTRIBUTION MARGIN

LO 4

Calculate the magnitude of operating leverage.

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

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

Applying this formula to the income statement data reported for Bragg Company and Biltmore Company in Exhibit 2.11 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 2.15 and 2.16 confirm these expectations.

EXHIBIT 2.15

Comparative Income Statements for Bragg Company

	10		11
Units (a)	10		11
Sales revenue ($20 × a)	$200	⇒ +10% ⇒	$220
Variable cost ($6 × a)	(60)		(66)
Contribution margin	140		154
Fixed cost	(120)		(120)
Net income	$ 20	⇒ +70% ⇒	$ 34

EXHIBIT 2.16

Comparative Income Statements for Biltmore Company

	10		11
Units (a)	10		11
Sales revenue ($20 × a)	$200	⇒ +10% ⇒	$220
Variable cost ($12 × a)	(120)		(132)
Contribution margin	80		88
Fixed cost	(60)		(60)
Net income	$ 20	⇒ +40% ⇒	$ 28

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 2.3

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   Since 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

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 2.17.

LO 1

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

EXHIBIT 2.17

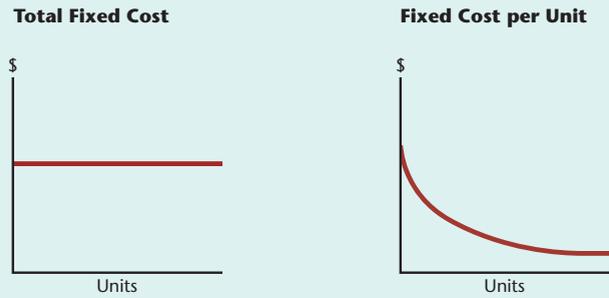### Graphical Presentation of Fixed Cost Behavior

Total Fixed Cost

Fixed Cost per Unit

Units

Units

EXHIBIT 2.18

Graphical Presentation of Variable Cost Behavior

Total Variable Cost

Variable Cost per Unit

Units

Units
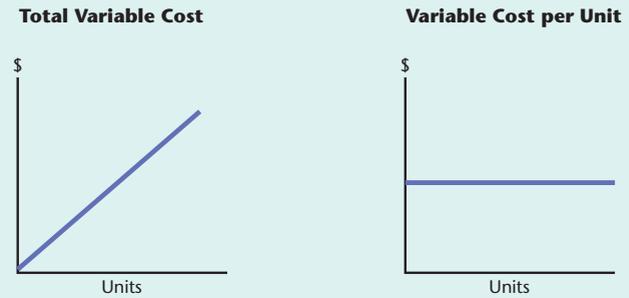
EXHIBIT 2.19

Fixed and Variable Cost Behavior

When Activity Level Changes	Total Cost	Cost per Unit
Fixed costs	Remains constant	Changes *inversely*
Variable costs	Changes in direct proportion	Remains constant

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 2.18.

The relationships between fixed and variable costs are summarized in the chart in Exhibit 2.19. Study these relationships thoroughly.

Mixed Costs (Semivariable Costs)

Mixed costs (semivariable costs) include both fixed and variable components. For example, suppose Star Productions, Inc., has to pay for janitorial services. The charge for these services includes a base fee of $1,000 plus $20 per hour required to do a cleanup. The $1,000 base fee is fixed. It is the same no matter how many hours it takes to accomplish the cleanup. In contrast, the $20 hourly cost is a variable cost because the total cost increases with each additional hour it takes to complete the cleanup. Since the total janitorial cost is composed of fixed and variable components, it is frequently called a mixed cost. It may also be called a semivariable cost.

Given the $1,000 base plus $20 per hour cost components, the total janitorial cost for any cleanup can be easily computed as shown below:

Total cost = Fixed cost + (Variable cost per hour × Number of hours)

If 60 hours are required to accomplish a cleanup, the total mixed cost is:

Total cost = $1,000 + ($20 × 60) = $2,200

If 90 hours are required to accomplish a cleanup, the total mixed cost is:

Total cost = $1,000 + ($20 × 90) = $2,800

Exhibit 2.20 illustrates a variety of mixed costs businesses commonly encounter.

EXHIBIT 2.20

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? Since 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 2.21.

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 2.21

Cost Behavior Relative to Number of Concerts

	1	2	3	4	5
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 2.4

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, since 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.

COST AVERAGING

LO 6

Select an appropriate time period for calculating the average cost per unit.

Lake Resorts, Inc. (LRI), offers water skiing lessons for guests. Since the demand for lessons is seasonal (guests buy more lessons in July than in December), LRI has chosen to rent (rather than own) the necessary equipment (boats, skis, ropes, life jackets) only when it is needed. LRI's accountant has collected the following data pertaining to providing ski lessons:

1. The daily fee to rent equipment is $80.
2. Instructors are paid $15 per lesson hour.
3. Fuel costs are $2 per lesson hour.
4. Lessons take one hour each.
5. LRI can provide up to 20 lessons in one day.

During a recent weekend, LRI provided 2 lessons on Friday, 10 on Saturday, and 20 on Sunday. Exhibit 2.22 shows the total cost per day and average cost per lesson for each of the three days. Since equipment rental cost is fixed relative to the number of lessons provided, the cost per lesson declines as the number of lessons increases. This explains why the cost per lesson is significantly lower on Sunday than Friday.

Assume LRI uses a cost-plus pricing strategy. The cost per lesson figures shown in Exhibit 2.22 are not useful in determining the price to charge customers. For example, it makes no sense to charge more for lessons on days like Friday when demand is low. Indeed, many businesses lower prices on days when demand is low in order to stimulate business.

The pricing problem can be solved by averaging the costs over a longer span of time. To illustrate, assume LRI uses the

EXHIBIT 2.22

Analysis of Total and Unit Cost

Number of Lessons (a)	2	10	20
Cost of equipment rental	$ 80	$ 80	$ 80
Cost of instruction (a × $15)	30	150	300
Cost of fuel (a × $2)	4	20	40
Total cost (b)	$114	$250	$420
Cost per lesson (b ÷ a)	$ 57	$ 25	$ 21

REALITY BYTES

Alice is a business student who works part time at **Costco Wholesale Corporation** to help pay for her college expenses. She is currently taking a managerial accounting course and has heard her instructor refer to depreciation as a fixed cost. However, as a requirement for her first accounting course, Alice reviewed Costco's financial statements for 2006, 2007, and 2008. The depreciation expense increased about 21 percent over these three years. She is not sure why depreciation expense would be considered a fixed cost.

Alice's accounting instructor reminded her that when an accountant says a cost is fixed, he or she means the cost is fixed in relation to one particular factor. A cost that is fixed in relation to one factor can be variable when compared to some other factor. For example, the depreciation for a retailer may be fixed relative to the number of customers who visit a particular store, but variable relative to the number of stores the company opens. In fact, Costco's depreciation increased from 2006 to 2008 mainly because the company built and opened additional stores.

Alice's instructor suggested that Costco's depreciation expense would be more stable if analyzed on a per store basis, rather than in total. Being curious, Alice prepared the following table, where costs are in thousands. Over the three years, she noted that total depreciation expense increased 21.1 percent, while depreciation per store increased only 11.8 percent. Although the costs on a per store basis were more stable than the total depreciation costs, they still were not fixed, so she asked her instructor for further explanation.

Fiscal year	Total Depreciation Expense	Average Depreciation Expense per Store
2006	$515,285	$1,125.1
2007	566,385	1,160.6
2008	653,082	1,275.6

The instructor suggested Costco's average per store depreciation costs were increasing because the equipment and buildings purchased for the new stores (opened from 2006 to 2008) probably cost more than those purchased for the older stores and Costco's new stores are often bigger than its older stores. This would raise the average depreciation expense per store. The instructor also reminded her that in the real world very few costs are perfectly fixed or perfectly variable.

weekly average instead of a daily average. Further, assume that the costs for the week include the following:

Equipment rental (7 days × $80 per day)	$ 560
Cost of instruction ($15 × 50 lessons)	750
Cost of fuel ($2 × 50 lessons)	100
Total	$1,410
Average cost per lesson	$1,410/50 lessons = $28.20

If LRI desires to earn a profit of $10 per lesson, the company will set the price at $38.20 ($28.20 weekly average cost per lesson + $10.00 profit) per lesson regardless of the day of the week that a lesson is administered. On slow days the daily profit margin

is less than $10 per lesson. Indeed, on Friday, when only two lessons are provided, LRI incurs a loss of $18.80 per lesson ($38.20 price per lesson − $57 daily average cost per lesson). This loss is offset on busy days when the daily profit margin exceeds the $10 weekly average. For example, on Sunday, when 20 lessons are administered, the profit margin is $17.20 per lesson ($38.20 price per lesson − $21 daily average cost per lesson). The differences in the daily profit margins average out over the course of the week. As a result, LRI is able to charge the same price per lesson regardless of the daily demand and still attain an average profit margin of $10 per lesson for the week.

The need for a weekly average occurs because the number of lessons per day fluctuates radically, thereby causing significant differences in the cost per lesson when calculated on a daily basis. A similar problem occurs if the number of lessons per week fluctuates radically from week to week. For example, the demand for skiing lessons may increase significantly during the week of July 4th or other holidays. Similarly, the demand for lessons may taper off toward the end of the summer. In this case, it will be necessary to expand the time frame for which the average is calculated, perhaps over the summer months or even several seasons.

Distortions can occur when the time period is too long as well as too short. For example, the price of fuel and equipment rental changes over time. If older costs are mixed with newer costs, the average does not represent current conditions. Choosing the best time frame for calculating the average cost of a product or service requires thoughtful analysis and judgment.

USE OF ESTIMATES IN REAL-WORLD PROBLEMS

LO 7

Use the high-low method, scattergraphs, and regression analysis to estimate fixed and variable costs.

Imagine trying to classify as fixed or variable all the different costs incurred by a large company such as **Delta Airlines**. Record keeping would be horrendous. Further complications would arise because some costs are mixed costs. Consider the cost Delta incurs to use airport facilities. An airport may charge Delta a flat annual rental fee for terminal space plus a charge each time a plane takes off or lands. The flat rental fee is a fixed cost while the charge per flight is variable. The total facilities cost is mixed.

To minimize the record-keeping difficulties involved in identifying actual fixed and variable costs, many companies make decisions using estimated rather than actual costs. Several techniques exist to divide total cost into estimated fixed and variable components.

High-Low Method of Estimating Fixed and Variable Costs

The management of Rainy Day Books (RDB) wants to expand operations. To help evaluate the risks involved in opening an additional store, the company president wants to know the amount of fixed cost a new store will likely incur. Suppose RDB's accountant decides to use the **high-low method** to supply the president with the requested information. The estimated amount of fixed cost for the new store would be developed in the following four steps.

EXHIBIT 2.23

Cost Data

Month	Units Sold	Total Cost
January	30,000	$450,000
February	14,000	300,000
March	12,000	150,000
April	25,000	440,000
May	10,000	180,000
June	11,000	240,000
July	20,000	350,000
August	18,000	400,000
September	17,000	360,000
October	16,000	320,000
November	27,000	490,000
December	34,000	540,000

Step 1 *Assemble sales volume and cost history for an existing store.* Assuming the new store would operate with roughly the same cost structure, the accountant can use the historical data to estimate the fixed cost likely to be incurred by the new store. To illustrate, assume the accounting data set for the existing store is displayed in Exhibit 2.23.

Step 2 *Select the high and low points in the data set.* In this example, the month with the lowest number of units sold does not correspond to the month with the lowest total cost. The lowest point in units sold occurred in May; the lowest total cost occurred in March. Because the total cost depends on the *number of units sold,* May should be

classified as the low point. The high point in sales volume occurred in December. The units sold and cost data for the December and May high and low points follow:

	Units Sold	Total Cost
High (December)	34,000	$540,000
Low (May)	10,000	$180,000

Step 3 *Determine the estimated variable cost per unit.* The variable cost per unit is determined by dividing the difference in the total cost by the difference in the number of units sold. In this case, the variable cost per unit is as follows:

$$\text{Variable cost per unit} = \frac{\text{Difference in total cost}}{\text{Difference in volume}} = \frac{(\$540,000 - \$180,000)}{(34,000 - 10,000)} = \frac{\$360,000}{24,000} = \$15$$

Step 4 *Determine the estimated total fixed cost.* The total fixed cost can now be determined by subtracting the variable cost from the total cost using either the high point or the low point. Either point yields the same result. Computations using the high point follow:

Fixed cost + Variable cost = Total cost

Fixed cost = Total cost − Variable cost

Fixed cost = $540,000 − ($15 × 34,000 units)

Fixed cost = $30,000

Once determined, the *total* fixed cost and variable cost *per unit* estimates can be used to predict expected total cost at any volume of activity as follows:

Total cost = Fixed cost + (Variable cost per unit × Number of units)

If 22,000 books are sold, the total estimated cost is:

Total cost = $30,000 + ($15 × 22,000) = $360,000

If 32,000 books are sold, the total estimated cost is:

Total cost = $30,000 + ($15 × 32,000) = $510,000

Although 12 data points are available, the high-low method uses only 2 of them to estimate the amounts of fixed and variable costs. If either or both of these points is not representative of the true relationship between fixed and variable costs, the estimates produced by the high-low method will be inaccurate. *The chief advantage of the high-low method is its simplicity; the chief disadvantage is its vulnerability to inaccuracy.* RDB's accountant decides to test the accuracy of the high-low method results.

Scattergraph Method of Estimating Fixed and Variable Costs

Scattergraphs are sometimes used as an estimation technique for dividing total cost into fixed and variable cost components. To assess the accuracy of the high-low estimate of fixed cost, RDB's accountant constructs a **scattergraph.** The horizontal axis is labeled with the number of books sold and the vertical axis with total costs. The 12 data points are plotted on the graph, and a line is drawn through the high and low points in the data set. The result is shown in Exhibit 2.24.

After studying the scattergraph in Exhibit 2.24, the accountant is certain that the high and low points are not representative of the data set. Most of the data points are above the high-low line. As shown in the second scattergraph in Exhibit 2.25, the line should be shifted upward to reflect the influence of the other data points.

EXHIBIT 2.24

Scattergraph Depicting High-Low Estimate

EXHIBIT 2.25

Scattergraph Depicting Line Drawn by Visual Inspection
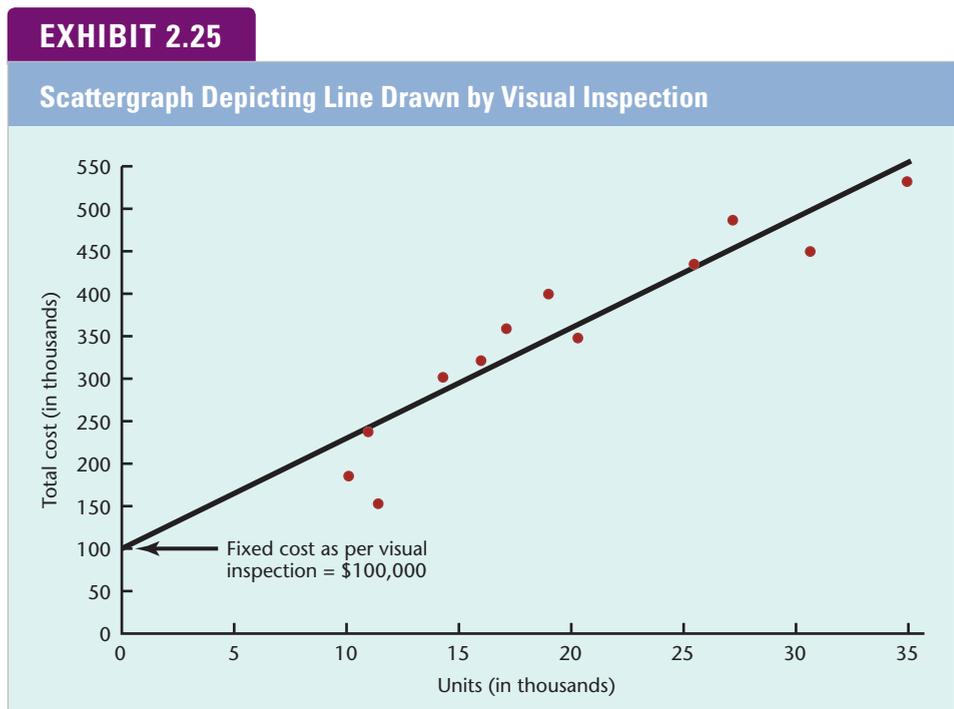
The graph in Exhibit 2.25 is identical to the graph in Exhibit 2.24 except the straight line is plotted through the center of the entire data set rather than just the high and low points. The new line, a **visual fit line,** is drawn to visually minimize the total distance between the data points and the line. Usually, half of the data points are above and half below a visual fit line. The estimated variable cost per unit is measured by the slope (steepness) of the visual fit line. The fixed cost is the point (the *intercept*) where the visual fit line intersects the vertical axis (the total cost line).

The intercept in Exhibit 2.25 provides a fixed cost estimate of $100,000. Although RDB's president had only asked for the amount of fixed cost, the variable cost can be easily determined by subtracting the fixed cost from the total cost at any point along

FOCUS ON INTERNATIONAL ISSUES

ANOTHER REASON FIXED COSTS AREN'T ALWAYS FIXED

Suppose that a company is renting a facility at an annual rental rate that does not change for the next five years *no matter what*. Is this a fixed cost? By now, you are aware that the proper response is to ask fixed in relation to what? Is the rental cost of this facility fixed in relation to the activity at this facility? The answer seems to be yes, but it might be "not necessarily."

Consider the **Exxon Mobil Corporation**. If Exxon Mobil rents facilities in a country in the eastern hemisphere, Malaysia for example, the annual rental fee may be stated and paid in the local currency. In Malaysia, this is the ringgit. Even though Exxon Mobil may be paying the same number of ringgit in rent each year, Exxon Mobil's rental cost in U.S. dollars could vary greatly over time. Such potential foreign currency exchange fluctuations cause companies to enter very complex hedging arrangements to add stability to transactions that must be paid in foreign currencies.

Exxon Mobil was founded and has its headquarters in the United States. It does much business in the United States. Furthermore, it is listed on the New York Stock Exchange and prepares its financial statements in U.S. dollars. However, it does much more business and has many more assets in countries outside the United States. Consider the following table from Exxon Mobil's 2008 financial statements. Before a multinational company can determine whether a cost is fixed, it must determine the applicable currency.

Geographical Area	Earnings*	Percentage of Total	Total Assets*	Percentage of Total
United States	$ 8,616	19%	$ 46,240	25%
Non-United States	37,894	81	139,094	75
Totals	$46,510	100%	$185,334	100%

*Amounts in millions.

the visual fit line. For example, at 15,000 units, total cost is $300,000. Variable cost is determined as follows:

$$\text{Fixed cost} + \text{Variable cost} = \text{Total cost}$$

$$\text{Variable cost} = \text{Total cost} - \text{Fixed cost}$$

$$\text{Variable cost} = \$300,000 - \$100,000$$

$$\text{Variable cost} = \$200,000$$

Variable cost per unit is $13.3333, calculated by dividing the total variable cost by the number of units ($200,000 ÷ 15,000 units = $13.3333 per unit).

As with the high-low method these *total* fixed cost and variable cost *per unit* estimates can be used to predict expected total cost at any volume of activity as follows:

$$\text{Total cost} = \text{Fixed cost} + (\text{Variable cost per unit} \times \text{Number of units})$$

If 22,000 books are sold, the total estimated cost is:

$$\text{Total cost} = \$100,000 + (\$13.3333 \times 22,000) = \$393,333$$

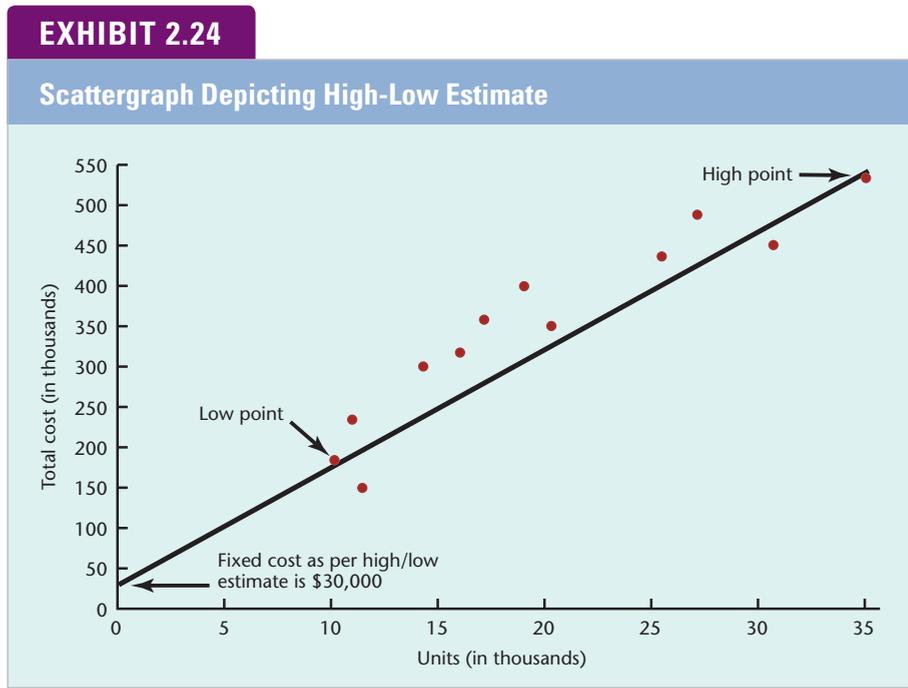If 32,000 books are sold, the total estimated cost is:

$$\text{Total cost} = \$100,000 + (\$13.3333 \times 32,000) = \$526,666$$

Clearly, the visual fit scattergraph approach produces different estimates of total cost than the high-low method provides. Remember, both approaches produce estimates about anticipated future costs. Accuracy cannot be determined until actual costs are incurred. Accountants must exercise judgment in deciding which method is the best approach for the particular circumstances under consideration.

Regression Method of Cost Estimation

Since the scattergraph is drawn by simple visual inspection, it is subject to human error. A better fit can be obtained using a statistical procedure known as **least-squares regression.**[2] Many of today's spreadsheet programs include a regression procedure. For example, the regression estimates shown in Exhibit 2.26 were generated in an *Excel* spreadsheet by performing the following functions.

EXHIBIT 2.26

Excel Spreadsheet Showing the Results of Least-Squares Regression

	Month	Units Sold	Total Cost
2	Month	Units Sold	Total Cost
3	January	30,000	$450,000
4	February	14,000	300,000
5	March	12,000	150,000
6	April	25,000	440,000
7	May	10,000	180,000
8	June	11,000	240,000
9	July	20,000	350,000
10	August	18,000	400,000
11	September	17,000	360,000
12	October	16,000	320,000
13	November	27,000	490,000
14	December	34,000	540,000

	Regression Statistics	
16	Regression Statistics	
17	Multiple R	0.9278612
18	R Square	0.8609264
19	Adj R Squar	0.8470191
20	Std Error	47284.664
21	Observation	12

		Coefficients	standard Erro	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
24	Intercept	72848.35	37975.2811	1.91831	0.084043	-11765.863	157462.56	-11765.863	157462.56
25	X Variable	14.29838	1.81729728	7.86793	1.36E-05	10.249184	18.347567	10.249184	18.347567

[2]Although the least-squares regression is a more accurate method than the high-low method and the visual scattergraph method, the three methods follow the same logical reasoning. Basically, the procedure locates a straight line on a coordinate with the *Y* axis representing the cost in dollars and the *X* axis representing the cost driver. In the examples shown in this chapter, the measurement of production in units is used as the cost driver and appears on the *X* axis. The basic regression model can be explained in the following equation:

$$Y = a + bX$$

Where

a = total fixed cost, or the *Y* intercept of the regression line
b = variable cost per unit of *X,* or the slope of the regression line
X = independent variable
Y = dependent variable

1. Enter the data in spreadsheet columns[3] (see columns B and C, rows 3 through 14 in Exhibit 2.26).

2. Click the *Data* tab.

3. Click *Data Analysis.*[4]

4. Click *Regression* and then *OK*.

5. Define data ranges and click *Line Fit Plot*.

6. Click *OK*.

Cost Estimates

The regression function returns a fixed cost estimate of $72,848 and a variable cost estimate of $14.30 per unit. These estimates are highlighted in blue in the spreadsheet shown in Exhibit 2.26. As with the high-low and visual fit scattergraph methods, the *total* fixed cost and variable cost *per unit* estimates computed using regression can be used to predict expected total cost at any volume of activity as follows:

Total cost = Fixed cost + (Variable cost per unit × Number of units)

If 22,000 books are sold, the total estimated cost is:

Total cost = $72,848 + ($14.30 × 22,000) = $387,448

If 32,000 books are sold, the total estimated cost is:

Total cost = $72,848 + ($14.30 × 32,000) = $530,448

As with the high-low method, **regression analysis** can be skewed by data points that are not representative of the complete data set. Here also, such outliers can be identified using visual fit scattergraphs. Again, management accountants must use common sense when interpreting the cost estimates. Choosing among the high-low method, visual fit scattergraphs, or regression analysis requires judgment. All three methods may be used to evaluate the consistency of the results.

Regression Statistics

An advantage of the regression method is that it provides statistics that give insight as to the reliability of the cost estimates. The R Square (R^2), highlighted in red in Exhibit 2.26, is the most commonly used measure of reliability. The **R^2 statistic** represents the percentage of change in the dependent variable (total cost) that is explained by a change in the independent variable (units sold). In the case of Rainy Day Books, the R^2 suggests that 86% of the change in the total monthly cost of operating a new store is caused by a change in the number of books sold. In other words, some factors other than the number of books sold also affect total costs. For example, the weight and size of the books, as well as the number sold, may affect shipping costs.

The R^2 values vary between zero and 100 percent. Higher R^2 values suggest that the independent variable more strongly influences the dependent variable. For Rainy Day Books, the relatively high R^2 of 86% suggests that the number of books sold will significantly affect the total cost of operating a new store.

Multiple Regression Analysis

As discussed above, Rainy Day Books' dependent variable (total cost) is influenced by more factors than the single independent variable (units sold). **Multiple regression analysis** is a statistical tool that permits analysis of how a number of independent variables

---

[3]Statistical reliability requires an information set that includes more than 30 data points. The illustration shown here has been limited in size to simplify the demonstration.

[4]If the data tab does not contain a data analysis option, it is likely that the statistical functions have not been activated in your program. You will need to consult the *Excel* user manual or help routine for instructions to activate the statistical functions.

simultaneously affect a dependent variable. Multiple regression analysis can improve the accuracy of fixed and variable cost estimates. A trial and error process using multiple regression analysis is frequently used to assess the relative importance of a variety of independent variables. The regression analysis is performed repeatedly, dropping and adding independent variables, until an acceptable level of accuracy is achieved.

<< 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, costs do not increase, allowing profits to soar. Alternatively, if sales volume decreases, 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.

Cost per unit is an average cost that is easier to compute than the actual cost of each unit and is more relevant to decision making than actual cost. Accountants must use judgment when choosing the time span from which to draw data for computing the average cost per unit. Distortions can result from using either too long or too short a time span.

Fixed and variable costs can be estimated using such tools as the *high-low method, scattergraphs* and regression analysis. The high-low method and scattergraphs are easy to use. Regression analysis is more accurate.

>> A Look Forward

The next chapter will show you how changes in cost, volume, and pricing affect profitability. You will learn to determine the number of units of product that must be produced and sold in order to break even (the number of units that will produce an amount of revenue that is exactly equal to total cost). You will learn to establish the price of a product using a cost-plus pricing approach and to establish the cost of a product using

a target-pricing approach. Finally, the chapter will show you how to use a break-even chart to examine potential profitability over a range of operating activity and how to use a technique known as *sensitivity analysis* to examine how simultaneous changes in sales price, volume, fixed costs, and variable costs affect profitability.

A step-by-step audio-narrated series of slides is provided on the text website at www.mhhe.com/edmonds2011.

SELF-STUDY REVIEW PROBLEM

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

a. 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?

b. Relative to the number of expeditions, is the cost of guides a fixed or a variable cost?

c. Determine the profit of an expedition assuming that five climbers are included in the trip.

d. Determine the profit assuming a 20 percent increase (six climbers total) in expedition revenue. What is the percentage change in profitability?

e. Determine the profit assuming a 20 percent decrease (four climbers total) in expedition revenue. What is the percentage change in profitability?

f. 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

g. 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?

h. Relative to the number of expeditions, is the cost of guides a fixed or a variable cost?

i. Determine the profit of an expedition assuming that five climbers are included in the trip.

j. Determine the profit assuming a 20 percent increase (six climbers total) in expedition revenue. What is the percentage change in profitability?

k. Determine the profit assuming a 20 percent decrease (four climbers total) in expedition revenue. What is the percentage change in profitability?

l. 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

Since 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

Since 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)	4,800		4,800		4,800
Net income	$1,200	⇐ (55.6%) ⇐	$2,700	⇒ +55.6% ⇒	$4,200

Percentage change in revenue: ±$1,500 ÷ $7,500 = ±20%
Percentage change in profit: ±$1,500 ÷ $2,700 = ±55.6%

Solution to Part 1, Requirement f

Since the cost of guide salaries remains fixed while volume (number of climbers) changes, the change in net income, measured in absolute dollars, exactly matches the change in revenue. More specifically, each time MMC increases the number of climbers by one, revenue and net income increase by $1,500. Since the base figure for net income ($2,700) is lower than the base figure for revenue ($7,500), the percentage change in net income ($1,500 ÷ $2,700 = 55.6%) is higher than percentage change in revenue ($1,500 ÷ $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

Since 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

Since 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)	3,840		4,800		5,760
Net income	$2,160	⇐ (20%) ⇐	$2,700	⇒ +20% ⇒	$3,240

Percentage change in revenue: ±$1,500 ÷ $7,500 = ±20%
Percentage change in profit: ±$540 ÷ $2,700 = ±20%

Solution for Part 2, Requirement l

Since 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.

KEY TERMS

Activity base 65	High-low method 68	R² statistic 73
Contribution margin 61	Least-squares regression 72	Regression analysis 73
Cost averaging 66	Mixed costs (semivariable	Relevant range 65
Cost behavior 54	costs) 64	Scattergraph 69
Cost structure 59	Multiple regression analysis 73	Variable cost 54
Fixed cost 54	Operating leverage 56	Visual fit line 70

QUESTIONS

1. Define *fixed cost* and *variable cost* and give an example of each.

2. How can knowing cost behavior relative to volume fluctuations affect decision making?

3. Define the term *operating leverage* and explain how it affects profits.

4. How is operating leverage calculated?

5. Explain the limitations of using operating leverage to predict profitability.

6. 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?

7. When are economies of scale possible? In what types of businesses would you most likely find economies of scale?

8. Explain the risk and rewards to a company that result from having fixed costs.

9. Are companies with predominately fixed cost structures likely to be more profitable?

10. 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.

11. Sam's Garage is trying to determine the cost of providing an oil change. Why would the average cost of this service be more relevant information than the actual cost for each customer?

12. When would the high-low method be appropriate for estimating variable and fixed costs? When would least-squares regression be the most desirable?

13. Which cost structure has the greater risk? Explain.

14. 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.

15. All costs are variable because if a business ceases operations, its costs fall to zero. Do you agree with the statement? Explain.

16. Because of seasonal fluctuations, Norel Corporation has a problem determining the unit cost of the products it produces. For example, high heating costs during the winter months causes per-unit cost to be higher than per-unit cost in the summer months even when the same number of units of product is produced. Suggest several ways that Norel can improve the computation of per-unit costs.

17. 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.

MULTIPLE-CHOICE QUESTIONS

Multiple-choice questions are provided on the text website at www.mhhe.com/edmonds2011.

www.mhhe.com/edmonds2011

EXERCISES—SERIES A

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

connect | ACCOUNTING

Exercise 2-1A   *Identifying cost behavior*   **LO 1**

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 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 costs.

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 2-2A   *Identifying cost behavior*

At the various activity levels shown, Ambrose 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 2-3A   *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.

LO 1

Exercise 2-4A   *Determining total variable cost*

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	0.25
Total	$7.75

Required

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

Exercise 2-5A   *Fixed versus variable cost behavior*   LO 1

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

	March	April
Production (units)	100	250
Rent	$1,500	$1,500
Utilities	$ 450	$1,125

Required

a. Separately calculate the rental cost per unit and the utilities cost per unit for both March and April.
b. Identify which cost is variable and which is fixed. Explain your answer.

Exercise 2-6A   *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	$84,000			
Cost per unit				
Fixed	$ 6.00			
Variable	6.00			
Total cost per trophy	$ 12.00			

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.

Exercise 2-7A   *Fixed versus variable cost behavior*   LO 1

Harrell 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 Harrell's major business risks and explain how they can be minimized.

Exercise 2-8A   *Fixed versus variable cost behavior*   LO 1, 2

Harrell 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 Harrell's likelihood of incurring a loss due to its operating activities.

LO 1

Exercise 2-9A   *Graphing fixed cost behavior*

The following graph setups depict the dollar amount of fixed cost on the vertical axes and the level of activity on the horizontal axes:

Total fixed cost

$

Units

Fixed cost per unit

$

Units
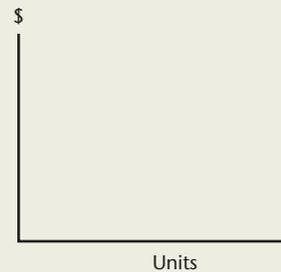
Required

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.

LO 1

Exercise 2-10A   *Graphing variable cost behavior*

The following graph setups depict the dollar amount of variable cost on the vertical axes and the level of activity on the horizontal axes:

Total variable cost

$

Units

Variable cost per unit

$

Units
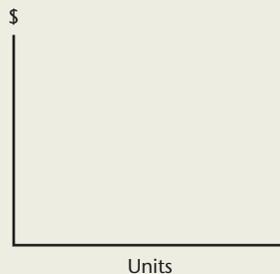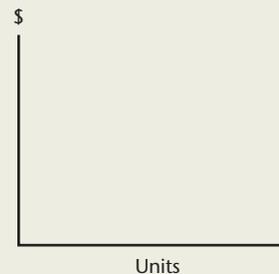
Required

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.

LO 1

Exercise 2-11A   *Mixed cost at different levels of activity*

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 2-12A   *Using fixed cost as a competitive business strategy*   LO 1, 2, 3

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	$ 6,000	$ 6,000

Required

a. 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.

b. 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.

c. Explain why the price-cutting strategy increased Hank Company's profits but caused a net loss for Rank Company.

Exercise 2-13A   *Using contribution margin format income statement to measure the*   LO 3, 4
                         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	$ 36,000

Required

a. Reconstruct the income statement using the contribution margin format.

b. Calculate the magnitude of operating leverage.

c. 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 2-14A   *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	$ 2,500

Required

a. Use the contribution margin approach to calculate the magnitude of operating leverage.

b. 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.

c. 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.

LO 6

Exercise 2-15A   *Averaging costs*

Getaway Camps, Inc., leases the land on which it builds camp sites. Getaway is considering opening a new site on land that requires $3,000 of rental payment per month. The variable cost of providing service is expected to be $7 per camper. The following chart shows the number of campers Getaway expects for the first year of operation of the new site:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
120	250	200	200	300	500	650	650	350	380	100	300	4,000

Required

Assuming that Getaway wants to earn $8 per camper, determine the price it should charge for a camp site in February and August.

LO 7

Exercise 2-16A   *Estimating fixed and variable costs using the high-low method*

Knox Boat Company makes inexpensive aluminum fishing boats. Production is seasonal, with considerable activity occurring in the spring and summer. Sales and production tend to decline in the fall and winter months. During 2011, the high point in activity occurred in June when it produced 200 boats at a total cost of $140,000. The low point in production occurred in January when it produced 40 boats at a total cost of $44,000.

Required

a. Use the high-low method to estimate the amount of fixed cost incurred each month by Knox Boat Company.

b. Determine the total estimated cost if 100 boats are made.

c. Comment on the strengths and weaknesses of the high-low method.

d. Explain how a visual fit scattergraph could be used to improve accuracy.

PROBLEMS—SERIES A

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

Problem 2-17A   *Identifying cost behavior*   **LO 1**

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.

  a. Pilots' salaries relative to the number of trips flown.
  b. Depreciation relative to the number of planes in service.
  c. Cost of refreshments relative to the number of passengers.
  d. Pilots' salaries relative to the number of passengers on a particular trip.
  e. Cost of a maintenance check relative to the number of passengers on a particular trip.
  f. 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.

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

Costs related to operating a fast-food restaurant follow.

  m. Depreciation of equipment relative to the number of restaurants.
  n. Building rental cost relative to the number of customers served in a particular restaurant.
  o. Manager's salary of a particular store relative to the number of employees.
  p. Food cost relative to the number of customers.
  q. Utility cost relative to the number of restaurants in operation.
  r. Company president's salary relative to the number of restaurants in operation.
  s. Land costs relative to the number of hamburgers sold at a particular restaurant.
  t. Depreciation of equipment relative to the number of customers served at a particular restaurant.

Problem 2-18A   *Cost behavior and averaging*   **LO 1, 6**

Carlia Weaver has decided to start Carlia Cleaning, a residential housecleaning 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.

eXcel

CHECK FIGURES
c. Total supplies cost for cleaning 30 houses: $180
d. Total cost for 20 houses: $2,370

Required

  a. Determine the total expected cost of equipment rental and the average 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?
  b. Determine the total expected cost of labor and the average 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?
  c. Determine the total expected cost of supplies and the average 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?
  d. Determine the total expected cost of cleaning houses, assuming that Carlia Cleaning cleans 10, 20, or 30 houses during one month.

e. Determine the average 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 percent above cost, would you assume that she means average or actual cost? Why?

LO 1

CHECK FIGURE

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

Problem 2-19A   *Context-sensitive nature of cost behavior classifications*

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.

Required

a. What is the relevant range of activity for new branch banks?

b. Determine the amount of teller cost in total and the average 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 average teller cost per branch for Pacific Bank, assuming that the start-up division operates 10, 15, or 25 branches. In this case (the activity base is the number of branches), is the teller cost a fixed or a variable cost?

LO 1

eXcel

CHECK FIGURES

a. Average cost at 400 units: $200

b. Average price at 250 units: $265

Problem 2-20A   *Context-sensitive nature of cost behavior classifications*

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.

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)	$225.00				

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?

Problem 2-21A   *Effects of operating leverage on profitability*

LO 1, 2

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 answers on the preceding information.

CHECK FIGURES
Part 1, b: $2,200
Part 2, h: $3,000 & 10%
Part 3, k: cost per student for 22 students: $25

Part 1:

Required

a. Relative to the number of students in a single course, is the cost of instruction a fixed or a variable cost?

b. Determine the profit, assuming that 20 students attend the course.

c. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 22 students). What is the percentage change in profitability?

d. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 18 students). What is the percentage change in profitability?

e. 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

f. Is the cost of instruction a fixed or a variable cost?

g. Determine the profit, assuming that 20 students take the course.

h. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 22 students). What is the percentage change in profitability?

i. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 18 students). What is the percentage change in profitability?

j. Explain why a 10 percent shift in enrollment produces a proportional 20 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

k. Calculate the workbook cost in total and per student, assuming that 18, 20, or 22 students attempt to attend the course.

l. Classify the cost of workbooks as fixed or variable relative to the number of students attending the course.

m. Discuss the risk of holding inventory as it applies to the workbooks.

n. Explain how a just-in-time inventory system can reduce the cost and risk of holding inventory.

LO 2

Problem 2-22A   *Effects of fixed and variable cost behavior on the risk and rewards of business opportunities*

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.

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, and assuming that both universities charge executives a $340 tuition fee per course attended.

f. It is always better to have fixed rather than variable cost. Explain why this statement is false.

g. It is always better to have variable rather than fixed cost. Explain why this statement is false.

LO 4

eXcel

Problem 2-23A   *Analyzing operating leverage*

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	$ 31,000	$ 31,000

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:* Since 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:* Since 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.

LO 6

Problem 2-24A   *Selecting the appropriate time period for cost averaging*

Trinkle Cinemas is considering a contract to rent a movie for $1,800 per day. The contract requires a minimum one-week rental period. Estimated attendance is as follows:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
450	300	200	550	1,000	1,000	500

Required

a. Determine the average cost per person of the movie rental contract separately for each day.
b. Suppose that Trinkle chooses to price movie tickets at cost as computed in Requirement *a* plus $2.50. What price would it charge per ticket on each day of the week?
c. Use weekly averaging to determine a reasonable price to charge for movie tickets.
d. Comment on why weekly averaging may be more useful to business managers than daily averaging.

Problem 2-25A *Identifying relevant issues for cost averaging*

LO 6

Cliff Corporation, offers mountain-climbing expeditions for its customers, providing food, equipment, and guides. Climbs normally require one week to complete. The company's accountant is reviewing historical cost data to establish a pricing strategy for the coming year. The accountant has prepared the following table showing cost data for the most recent climb, the company's average cost per year, and the five-year average cost.

	Span of Time		
	Recent Climb	**One Year**	**Five Years**
Total cost of climbs (a)	$4,800	$266,000	$1,125,000
Number of climbers (b)	10	560	2,500
Cost per climber (a ÷ b)	$480	$475	$450

Required

Write a memo that explains the potential advantages and disadvantages of using each of the per-unit cost figures as a basis for establishing a price to charge climbers during the coming year. What other factors must be considered in developing a pricing strategy?

Problem 2-26A *Estimating fixed and variable cost*

LO 7

Newteh Computer Services, Inc., has been in business for six months. The following are basic operating data for that period.

	Month					
	July	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
Service hours	120	136	260	420	320	330
Revenue	$6,000	$6,800	$13,000	$21,000	$16,000	$16,500
Operating costs	$4,300	$5,300	$ 7,100	$11,200	$ 9,100	$10,600

Required

a. What is the average service revenue per hour for the six-month time period?
b. Use the high-low method to estimate the total monthly fixed cost and the variable cost per hour.
c. Determine the average contribution margin per hour.
d. Use the scattergraph method to estimate the total monthly fixed cost and the variable cost per hour.
e. Compare the results of the two methods and comment on the difference.

Problem 2-27A *Estimating fixed and variable cost*

LO 7

Nabil Woodcraft Company (NWC) manufactures "antique" wooden cabinets to house modern radio and CD players. NWC began operations in January of last year. Paul Nabil, the owner, asks for your assistance. He believes that he needs to better understand the cost of the cabinets for pricing purposes. You have collected the following data concerning actual production over the past year:

Month	Number of Cabinets Produced	Total Cost
January	800	$21,000
February	3,600	32,500
March	1,960	29,500
April	600	18,600
May	1,600	29,000
June	1,300	27,000
July	1,100	25,600
August	1,800	31,000
September	2,280	32,000
October	2,940	31,500
November	3,280	32,000
December	400	16,500

Required

a. To understand the department's cost behavior, you decide to plot the points on graph paper and sketch a total cost line.

   (1) Enter the number of units and their costs in increasing order.
   (2) Plot the points on the graph.
   (3) Sketch a graph so the line "splits" all of the points (half of the points appear above and half below the line).
   (4) Using the line you just sketched, visually estimate the total cost to produce 2,000 units.

b. Using the high-low method, compute the total cost equation for the preceding data.

   (1) Compute the variable cost per unit.
   (2) Compute total fixed costs.
   (3) Sketch a line between the high and low points on your graph.
   (4) Calculate the total cost assuming 2,000 cabinets are made.

c. Comment on which method you believe is better.

LO 7

Problem 2-28A *Estimating fixed and variable cost using the regression method*

CHECK FIGURES
b. VC/hr: $15.19
  FC: $1,142

Latif and Koehler Tax Services Company has 31 branch offices in the nation. Each office has about three to six professional accountants and one to two secretaries. In a busy season, the office manager, who is also a professional accountant, can hire temporary employees for support work such as document filing and typing. Josh Lane, the president, is wondering whether he should expand his business by opening more offices. One of the factors that he is considering is how to estimate office support costs. Vineeta Riley, the accountant, collected the following cost data for all 31 offices:

Branch	Professional Hours	Support Costs	Branch	Professional Hours	Support Costs
A1	225	$4,241	F2	165	$3,856
A2	113	3,435	G1	358	5,936
A3	387	6,398	G2	471	8,615
A4	412	6,502	G3	492	9,639
B1	258	4,140	G4	328	5,968
B2	146	3,368	G5	359	7,115
B3	275	3,820	G6	174	3,287
D1	364	6,396	H1	394	7,515
D2	190	3,946	H2	386	7,374
D3	484	8,189	I2	279	5,376
D4	251	4,506	I5	314	5,784
D5	377	6,744	J2	283	5,426
E1	264	4,645	J3	198	4,418
E2	169	6,073	J4	226	4,506
E3	338	6,290	J5	341	6,488
F1	437	9,113			

Required

a. The company uses the number of professional hours as the cost driver for office support costs. Use an algebraic equation to describe how total office support costs can be estimated.

b. Use a spreadsheet program to perform a regression analysis. Use office support costs as the dependent variable (Y) and the professional hours as the independent variable (X). Determine the total fixed cost per office and variable cost per professional hour.

c. Identify the R^2 statistic provided by the Excel program and explain what it means.

d. Mr. Lane plans to open a new branch office in a Chicago suburb. He expects that the monthly professional hours will be 3,000. Estimate the total office support cost for Mr. Lane. What portion of the total cost is fixed and what portion is variable?

e. Explain how multiple regression analysis could be used to improve the accuracy of the cost estimates.

EXERCISES—SERIES B

Exercise 2-1B   *Identifying cost behavior*   LO 1

Parker Copies Company provides professional copying services to customers through the 35 copy stores it operates in the southwestern United States. Each store employs a manager and four assistants. The manager earns $4,000 per month plus a bonus of 3 percent of sales. The assistants earn hourly wages. Each copy store costs $3,000 per month to lease. The company spends $5,000 per month on corporate-level advertising and promotion.

Required

Classify each of the following costs incurred by Parker Copies as fixed, variable, or mixed:

a. Lease cost relative to the number of stores.
b. Advertising and promotion costs relative to the number of copies a particular store makes.
c. Lease cost relative to the number of copies made for customers.
d. Assistants' wages relative to the number of copies made for customers.
e. Store manager's salary relative to the number of copies made for customers.
f. Cost of paper relative to the number of copies made for customers.

Exercise 2-2B   *Identifying cost behavior*   LO 1

At the various sales levels shown, Kukreja Company incurred the following costs:

	Units sold	50	100	150	200	250
a.	Total insurance cost	$ 500.00	$ 500.00	$ 500.00	$ 500.00	$ 500.00
b.	Total salary cost	1,500.00	2,000.00	2,500.00	3,000.00	3,500.00
c.	Cost per unit of merchandise sold	8.00	8.00	8.00	8.00	8.00
d.	Total cost of goods sold	4,000.00	8,000.00	12,000.00	16,000.00	20,000.00
e.	Depreciation cost per unit	30.00	15.00	10.00	7.50	6.00
f.	Total rent cost	600.00	600.00	600.00	600.00	600.00
g.	Total shipping cost	40.00	80.00	120.00	160.00	200.00
h.	Rent cost per unit of merchandise sold	12.00	6.00	4.00	3.00	2.40
i.	Total utility cost	200.00	300.00	400.00	500.00	600.00
j.	Supplies cost per unit	4.00	4.00	4.00	4.00	4.00

Required

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

LO 1

Exercise 2-3B   *Determining fixed cost per unit*

Miranda Corporation incurs the following annual fixed production costs:

Item	Cost
Insurance cost	$ 50,000
Patent amortization cost	400,000
Depreciation cost	250,000
Property tax cost	100,000

Required

Determine the total fixed production cost per unit if Miranda produces 10,000, 20,000, or 50,000 units.

LO 1

Exercise 2-4B   *Determining total variable cost*

The following variable manufacturing costs apply to goods produced by King Manufacturing Corporation:

Item	Cost per Unit
Materials	$2.80
Labor	2.40
Variable overhead	2.00
Total	$7.20

Required

Determine the total variable manufacturing cost if King produces 4,000, 6,000, or 8,000 units.

LO 1

Exercise 2-5B   *Fixed versus variable cost behavior*

Griffin Company's production and total cost data for two recent months follow:

	January	February
Units produced	1,000	500
Total depreciation cost	$4,000	$4,000
Total factory supplies cost	$2,000	$1,000

Required

a.   Separately calculate the depreciation cost per unit and the factory supplies cost per unit for both January and February.

b.   Identify which cost is variable and which is fixed. Explain your answer.

LO 1

Exercise 2-6B   *Fixed versus variable cost behavior*

Satcher Chairs Corporation produces ergonomically designed chairs favored by architects. The company normally produces and sells from 4,000 to 10,000 chairs per year. The following cost data apply to various production activity levels:

Number of Chairs	4,000	6,000	8,000	10,000
Total costs incurred				
Fixed	$ 84,000			
Variable	60,000			
Total costs	$144,000			
Per-unit chair cost				
Fixed	$ 21.00			
Variable	15.00			
Total cost per chair	$ 36.00			

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.

b. Explain why the total cost per chair decreases as the number of chairs increases.

Exercise 2-7B   *Fixed versus variable cost behavior*   LO 1, 2

Dennis Owen needs extra money quickly to help cover some unexpected school expenses. Mr. Owen has learned fortune-telling skills through his long friendship with Joel Allman, who tells fortunes during the day at the city market. Mr. Allman has agreed to let Mr. Owen use his booth to tell fortunes during the evening for a rent of $50 per night.

Required

a. What is the booth rental cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25?

b. Is the cost of renting the fortune-telling booth fixed or variable relative to the number of customers?

c. Draw two graphs. On one, plot total booth rental cost for 5, 10, 15, 20, and 25 customers; on the other, plot booth rental cost per customer for 5, 10, 15, 20, or 25 customers.

d. Mr. Owen has little money. What major business risks would he take by renting the fortune-telling booth? How could he minimize those risks?

Exercise 2-8B   *Fixed versus variable cost behavior*   LO 1, 2

In the evenings, Dennis Owen works telling fortunes using his friend Joel Allman's booth at the city market. Mr. Allman pays the booth rental, so Mr. Owen has no rental cost. As a courtesy, Mr. Owen provides each customer a soft drink. The drinks cost him $0.50 per customer.

Required

a. What is the soft drink cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25?

b. Is the soft drink cost fixed or variable?

c. Draw two graphs. On one, plot total soft drink cost for 5, 10, 15, 20, and 25 customers; on the other, plot soft drink cost per customer for 5, 10, 15, 20, and 25 customers.

d. Comment on the likelihood that Mr. Owen will incur a loss on this business venture.

Exercise 2-9B   *Graphing fixed cost behavior*   LO 1

Saeed Computers leases space in a mall at a monthly rental cost of $3,000. The following graph setups depict rental cost on the vertical axes and activity level on the horizontal axes:

Total monthly rental cost

$

Number of computers sold

Rental cost per computer

$
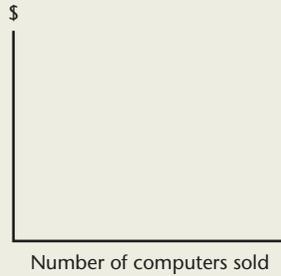
Number of computers sold
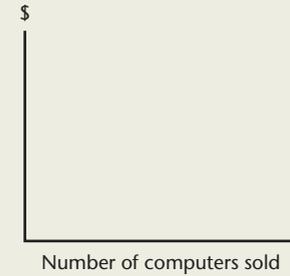
Required

a. Draw a line that depicts the relationship between the total monthly rental cost and the number of computers sold.

b. Draw a line that depicts the relationship between rental cost per computer and the number of computers sold.

LO 1

Exercise 2-10B   *Graphing variable cost behavior*

Dubovsky Computers purchases computers from a manufacturer for $500 per computer. The following graph setups depict product cost on the vertical axes and activity level on the horizontal axes:

Total product cost

$

Number of computers sold
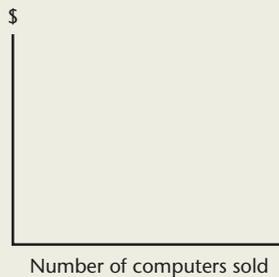
Product cost per computer

$

Number of computers sold
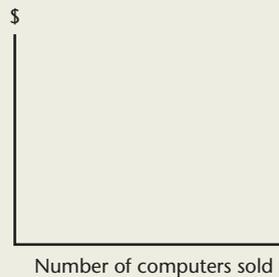
Required

a. Draw a line that depicts the relationship between total product cost and the number of computers sold.

b. Draw a line that depicts the relationship between cost per computer and the number of computers sold.

LO 1

Exercise 2-11B   *Mixed cost at different levels of activity*

Blackwell Hats Corporation uses workers in Indonesia to manually weave straw hats. The company pays the workers a daily base wage plus $0.25 per completed hat. On Monday, workers produced 100 hats for which the company paid wages of $70.

Required

Calculate the total cost of the workers' wages for each of the following days:

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost				
Total fixed cost				
Total wages cost				

Exercise 2-12B   *Effect of cost structure on projected profits*   LO 1, 2

Bland and Strand compete in the same market. The following budgeted income statements illustrate their cost structures:

Income Statements		
	Company	
	Bland	**Strand**
Number of customers (a)	100	100
Sales revenue (a × $100)	$10,000	$10,000
Variable cost (a × $64)	NA	(6,400)
Contribution margin	10,000	3,600
Fixed costs	(6,400)	N/A
Net income	$ 3,600	$ 3,600

Required

a. Assume that Bland can lure all 100 customers away from Strand by lowering its sales price to $60 per customer. Reconstruct Bland's income statement based on 200 customers.

b. Assume that Strand can lure all 100 customers away from Bland by lowering its sales price to $60 per customer. Reconstruct Strand's income statement based on 200 customers.

c. Why does the price-cutting strategy increase Bland's profits but result in a net loss for Strand?

Exercise 2-13B   *Using a contribution margin format income statement to measure*   LO 3, 4
                     the magnitude of operating leverage

Willig Company, a merchandising firm, reported the following operating results:

Income Statements	
Sales revenue (4,000 units × $75)	$ 300,000
Cost of goods sold (4,000 units × $45)	(180,000)
Gross margin	120,000
Sales commissions (10% of sales revenue)	(30,000)
Administrative salaries expense	(25,000)
Advertising expense	(31,000)
Depreciation expense	(24,000)
Shipping and handling expense (4,000 units × $1)	(4,000)
Net income	$ 6,000

Required

a. Reconstruct the income statement using the contribution margin format.

b. Calculate the magnitude of operating leverage.

c. Use the measure of operating leverage to determine the amount of net income that Willig will earn if sales revenue increases by 10 percent.

Exercise 2-14B   *Assessing the magnitude of operating leverage*   LO 4

The following budgeted income statement applies to Biggio Company:

Income Statement	
Sales Revenue (1,000 units × $90)	$ 90,000
Variable Cost (1,000 units × $50)	(50,000)
Contribution margin	40,000
Fixed Costs	(30,000)
Net Income	$ 10,000

Required

a. Use the contribution margin approach to calculate the magnitude of operating leverage.
b. Use the operating leverage measure computed in Requirement *a* to determine the amount of net income that Biggio Company will earn if sales volume increases by 10 percent. Assume the sales price per unit remains unchanged at $90.
c. Verify your answer to Requirement *b* by constructing an alternative income statement based on a 10 percent increase in sales volume. The sales price per unit remains unchanged at $90. Calculate the percentage change in net income for the two income statements.

LO 6

Exercise 2-15B   *Averaging costs*

Nuttall Entertainment Company operates a movie theater that has monthly fixed expenses of $5,000. In addition, the company pays film distributors $1.00 per ticket sold. The following chart shows the number of tickets Nuttall expects to sell in the coming year:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2,000	1,600	3,200	3,400	3,200	4,200	4,700	4,000	5,000	3,100	3,000	2,600	40,000

Required

Assume that Nuttall wants to earn $3.00 per movie patron. What price should it charge for a ticket in January and in September?

LO 7

Exercise 2-16B   *Estimating fixed and variable costs using the high-low method*

Conry Ice Cream Company produces various ice cream products for which demand is highly seasonal. The company sells more ice cream in warmer months and less in colder ones. Last year, the high point in production activity occurred in August when Conry produced 50,000 gallons of ice cream at a total cost of $42,000. The low point in production activity occurred in February when the company produced 20,000 gallons of ice cream at a total cost of $33,000.

Required

a. Use the high-low method to estimate the amount of fixed cost per month incurred by Conry Ice Cream Company.
b. Determine the total estimated monthly cost when 40,000 gallons of ice cream are produced.
c. What factors could cause the estimate determined in Requirement *b* to be inaccurate?
d. Explain how regression analysis could be used to improve accuracy. Your explanation should include a discussion of the R^2 statistic as well as the potential impact of multiple regression analysis.

PROBLEMS—SERIES B

LO 1

Problem 2-17B   *Identifying cost behavior*

Required

Identify the following costs as fixed or variable:

Costs related to operating a retail gasoline company.

a. Depreciation of equipment relative to the number of stations.
b. Cashiers' wages relative to the number of customers served in a station.
c. Salary of a manager of a particular station relative to the number of employees.
d. Gasoline cost relative to the number of customers.
e. Utility cost relative to the number of stations in operation.
f. The company's cost of national TV commercials relative to the number of stations in operation.
g. Depreciation of equipment relative to the number of customers served at a station.
h. Property and real estate taxes relative to the amount of gasoline sold at a particular station.

Costs related to shuttle bus trips between John F. Kennedy International Airport and downtown New York. Each bus driver receives a specific salary per month. A manager schedules bus trips and supervises drivers, and a secretary receives phone calls.

  i. Fuel costs relative to the number of passengers on a particular trip.
  j. Drivers' salaries relative to the number of trips driven.
  k. Office staff salaries relative to the number of passengers on a particular trip.
  l. Depreciation relative to the number of buses in service.
  m. A driver's salary relative to the number of passengers on a particular trip.
  n. Fuel costs relative to the number of trips.

Suzy's Barbershop operates several stores in shopping centers. Each store employs a supervisor and three barbers. Each barber receives a specific salary per month plus a 10 percent commission based on the service revenues he or she has generated.

  o. Store rental costs relative to the number of customers.
  p. Barbers' commissions relative to the number of customers.
  q. Supervisory salaries relative to the number of customers served in a particular store.
  r. Barbers' salaries relative to the number of barbers in a particular district.
  s. Supplies cost relative to the number of hair services provided in a particular store.
  t. Barbers' salaries relative to the number of customers served at a particular store.

Problem 2-18B   *Cost behavior and averaging*   LO 1, 6

Andy Posey asks you to analyze the operating cost of his lawn services business. He has bought the needed equipment with a cash payment of $45,000. Upon your recommendation, he agrees to adopt straight-line depreciation. The equipment has an expected life of three years and no salvage value. Mr. Posey pays his workers $30 per lawn service. Material costs, including fertilizer, pesticide, and supplies, are expected to be $6 per lawn service.

Required

  a. Determine the total cost of equipment depreciation and the average cost of equipment de-preciation per lawn service, assuming that Mr. Posey provides 20, 25, or 30 lawn services during one month. Is the cost of equipment a fixed or a variable cost?
  b. Determine the total expected cost of labor and the average expected cost of labor per lawn service, assuming that Mr. Posey provides 20, 25, or 30 lawn services during one month. Is the cost of labor a fixed or a variable cost?
  c. Determine the total expected cost of materials and the average expected cost of materials per lawn service, assuming that Mr. Posey provides 20, 25, or 30 lawn services during one month. Is the cost of fertilizer, pesticide, and supplies a fixed or a variable cost?
  d. Determine the total expected cost per lawn service, assuming that Mr. Posey provides 20, 25, or 30 lawn services during one month.
  e. Determine the average expected cost per lawn service, assuming that Mr. Posey provides 20, 25, or 30 lawn services during one month. Why does the cost per unit decrease as the number of lawn services increases?
  f. If Mr. Posey tells you that he prices his services at 30 percent above cost, would you assume that he means average or actual cost? Why?

Problem 2-19B   *Context-sensitive nature of cost behavior classifications*   LO 1

Warren and Carter Tax Services' Development Department is responsible for establishing new community branches. Each branch opens with two tax accountants. Total cost of payroll per branch is $108,000 per year. Together the two accountants can process up to 2,500 simple tax returns per year. The firm's policy requires closing branches that do not reach the quota of 1,500 tax returns per year. On the other hand, the firm hires an additional accountant for a branch and elevates it to the status of a regular operation if the customer demand for services exceeds 2,500 tax returns.

Required

  a. What is the relevant range of activity for a new branch established by the Development Department?

b. Determine the amount of payroll cost in total and the average payroll cost per transaction for a branch that processes 1,500, 2,000, or 2,500 tax returns. In this case (the activity base is the number of tax returns for a specific branch), is the payroll cost a fixed or a variable cost?

c. Determine the amount of payroll cost in total and the average payroll cost per branch for Warren and Carter Tax Services, assuming that the Development Department operates 20, 30, or 40 branches. In this case (the activity base is the number of branches), is the payroll cost a fixed or a variable cost?

LO 1

Problem 2-20B   *Context-sensitive nature of cost behavior classifications*

Kevin Munden sells a newly developed camera, Sharp Vision. He purchases the cameras from the manufacturer for $70 each and rents a store in a shopping mall for $5,000 per month.

Required

a. Determine the average cost of sales per unit if Mr. Munden sells 100, 200, 300, 400, or 500 units of Sharp Vision per month. Use the following chart to organize your answer.

	Sales Volume in Units (a)				
	100	200	300	400	500
Total cost of cameras (a × $70)	$ 7,000				
Total cost of store rental	5,000				
Total cost of sales (b)	$12,000				
Average cost per unit (b ÷ a)	$120.00				

b. If Mr. Munden wants to make a gross profit of $20 on each camera he sells, what price should he charge at sales volumes of 100, 200, 300, 400, or 500 units?

c. Record the total cost of store rental if Mr. Munden opens a camera store at one, two, three, four, or five shopping malls. Record your answers in the following chart. Is the cost of store rental fixed or variable relative to the number of stores opened?

	Shopping Malls				
	1	2	3	4	5
Total cost of store rental	$5,000				

d. Mr. Munden provides decorative ornaments to customers who purchase cameras. Some customers take the ornaments, others do not, and some take more than one. The number of ornaments varies in relation to the number of cameras sold, but the relationship is not proportional. Assume that, on average, Mr. Munden gives away $150 worth of ornaments for every 100 cameras sold. What is the additional cost per camera sold? Is the cost fixed or variable?

LO 1, 2

Problem 2-21B   *Effects of operating leverage on profitability*

CPAs R Us conducts CPA review courses. Public universities that permit free use of a classroom support the classes. The only major expense incurred by CPAs R Us is the salary of instructors, which is $6,000 per course taught. The company recently planned to offer a review course in Houston for $320 per candidate; it estimated that 50 candidates would attend the course.

Complete these requirements based on the preceding information.

Part 1:

Required

a. Relative to the number of CPA candidates in a single course, is the cost of instruction a fixed or a variable cost?

b. Determine the profit, assuming that 50 candidates attend the course.

c. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

d. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

e. 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, he wants $120 per candidate attending the class. Assume that the tuition fee remains at $320 per candidate.

Required

f. Is the cost of instruction a fixed or a variable cost?

g. Determine the profit, assuming that 50 candidates take the course.

h. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

i. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

j. Explain why a 10 percent shift in enrollment produces a proportional 10 percent shift in profitability.

Part 3:

CPAs R Us sells a workbook to each student who attends the course. The workbook contains printed material unique to each course. Workbooks that are not sold must be destroyed. Prior to the first class, CPAs R Us printed 50 copies of the books based on the estimated number of people who would attend the course. Each workbook costs $40 and is sold for $50. This cost includes a royalty fee paid to the author and the cost of duplication.

Required

k. Calculate the total cost and the cost per candidate of the workbooks, assuming that 45, 50, or 55 candidates attempt to attend the course.

l. Classify the cost of workbooks as fixed or variable relative to the number of candidates attending the course.

m. Discuss the risk of holding inventory as it applies to the workbooks.

n. Explain how a just-in-time inventory system can reduce the cost and risk of holding inventory.

Problem 2-22B   *Effects of fixed and variable cost behavior on the risk and rewards of business opportunities*

LO 2

Beach Club and Mountain Club are competing health and recreation clubs in Chicago. They both offer tennis training clinics to adults. Beach pays its coaches $9,000 per season. Mountain pays its coaches $300 per student enrolled in the clinic per season. Both clubs charge a tuition fee of $432 per season.

Required

a. Prepare income statements for Beach and Mountain, assuming that 30 students per season attend each clinic.

b. The ambitious new director of Beach Club tries to increase his market share by reducing the club's tuition per student to $250 per clinic. Prepare an income statement for Beach, assuming that the club attracts all of Mountain's customers and therefore is able to enroll 60 students in its clinics.

c. Independent of Requirement *b*, Mountain Club tries to lure Beach's students by lowering its price to $210 per student. Prepare an income statement for Mountain, assuming that the club succeeds in enrolling 60 students in its clinics.

d. Explain why the strategy described in Requirement *b* produced a profit while the same strategy described in Requirement *c* produced a loss.

e. Prepare an income statement for Beach Club and Mountain Club, assuming that 18 students attend a clinic at the original $432 tuition price.

f. It is always better to have fixed rather than variable cost. Explain why this statement is false.

g. It is always better to have variable rather than fixed cost. Explain why this statement is false.

LO 5, 6

Problem 2-23B *Analysis of operating leverage*

Rachel Geer has invested in two start-up companies. At the end of the first year, she asks you to evaluate their operating performance. The following operating data apply to the first year:

	Company Name	
	Ander	**Sander**
Variable cost per unit (a)	$12	$6
Sales revenue (25,000 units × $16)	$400,000	$400,000
Variable cost (25,000 units × a)	(300,000)	(150,000)
Contribution margin	100,000	250,000
Fixed cost	(50,000)	(200,000)
Net income	$ 50,000	$ 50,000

Required

a. Use the contribution margin approach to compute the operating leverage for each firm.

b. If the economy expands in the coming year, Ander and Sander will both enjoy a 10 percent per year increase in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units increases, both revenue and variable cost will increase.) Compute the change in net income for each firm in dollar amount and in percentage.

c. If the economy contracts in the following year, Ander and Sander will both suffer a 10 percent decrease in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units decreases, both revenue and variable cost decrease.) Compute the change in net income for each firm in both dollar amount and percentage.

d. Write a memo to Rachel Geer with your evaluation and recommendations.

LO 6

Problem 2-24B *Selecting the appropriate time period for cost averaging*

The Vaughan Amusement Park is considering signing a contract to hire a circus at a cost of $2,400 per day. The contract requires a minimum performance period of one week. Estimated circus attendance is as follows:

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
500	450	450	600	950	1,500	1,400

Required

a. For each day, determine the average cost of the circus contract per person attending.

b. Suppose that the park prices circus tickets at cost as computed in Requirement *a* plus $1.60. What would be the price per ticket charged on each day of the week?

c. Use weekly averaging to determine a reasonable price to charge for the circus tickets.

d. Comment on why weekly averaging may be more useful to business managers than daily averaging.

LO 5

Problem 2-25B *Identifying relevant issues for cost averaging*

Sahara Tours, Inc., organizes adventure tours for people interested in visiting a desert environment. A desert tour generally lasts three days. Sahara provides food, equipment, and guides. Larry Jobaria, the president of Sahara Tours, needs to set prices for the coming year. He has available the company's past cost data in the following table:

Span of Time

	Recent Tour	One Year	Ten Years
Total cost of tours (a)	$8,000	$390,000	$2,700,000
Number of tourists (b)	32	1,500	12,000
Cost per tourist (a ÷ b)	$ 250	$ 260	$ 225

Required

Write a memo to Mr. Jobaria explaining the potential advantages and disadvantages of using each of the different per-tourist cost figures as a basis for establishing a price to charge tourists during the coming year. What other factors must Mr. Jobaria consider in developing a pricing strategy?

Problem 2-26B   *Estimating fixed and variable costs*   LO 7

Hanno Legal Services provides legal advice to clients. The following data apply to the first six months of operation:

Month

	Jan.	Feb.	Mar.	Apr.	May	June
Service hours	60	80	120	160	180	200
Revenue	$4,800	$6,400	$9,600	$12,800	$14,400	$16,000
Operating costs	6,200	7,100	8,380	8,500	8,761	9,700

Required

a. What is the average service revenue per hour for the six-month time period?

b. Use the high-low method to estimate the total monthly fixed cost and the variable cost per hour.

c. Determine the average contribution margin per hour.

d. Use the scattergraph method to estimate the total monthly fixed cost and the variable cost per hour.

e. Compare the results of the two methods and comment on any differences.

Problem 2-27B   *Estimating fixed and variable cost*   LO 7

Vicardo Frames Company, which manufactures ornate frames for original art work, began operations in January 2011. Sam Waits, the owner, asks for your assistance. He believes that he needs to better understand the cost of the frames for pricing purposes. You have collected the following data concerning actual production over the past year:

Month	Number of Frames Produced	Total Cost
January	1,600	$42,000
February	7,200	65,000
March	3,920	59,000
April	1,200	37,200
May	3,200	58,000
June	2,600	54,000
July	2,200	51,200
August	3,600	62,000
September	4,560	64,000
October	5,880	63,000
November	6,560	64,000
December	800	33,000

Required

a. To understand the department's cost behavior, you decide to plot the points on graph paper and sketch a total cost line.

(1) Enter the number of units and their costs in increasing order.

(2) Plot the points on the graph.

(3) Sketch a graph so the line "splits" all of the points (half of the points appear above and half appear below the line).

(4) Using the line you just sketched, visually estimate the total cost to produce 4,000 units.

b. Using the high-low method, compute the total cost equation for the preceding data.

(1) Compute the variable cost per unit.

(2) Compute total fixed costs.

(3) Sketch a line between the high and low points on your graph.

(4) Using the high-low method, estimate the total cost to produce 4,000 units.

c. Name a third method that could be used to determine the fixed and variable cost estimate and comment on the advantages of your suggested approach.

LO 7

Problem 2-28B *Estimating fixed and variable cost using the regression method*

Ray Rogers, the production manager of Martin Construction Components, is trying to figure out the cost behavior of his factory supplies cost. The company uses machine hours as the cost driver. Victor Hoover, the assistant manager, collected the following cost data for the last 32 weeks:

Week No.	Machine Hours	Supplies Costs	Week No.	Machine Hours	Supplies Costs
1	86	$3,819	17	64	$3,856
2	72	3,610	18	88	4,279
3	79	3,916	19	129	5,633
4	62	2,915	20	137	5,298
5	91	4,327	21	144	6,721
6	42	2,214	22	37	2,448
7	37	2,106	23	56	3,528
8	33	2,390	24	49	2,837
9	23	2,107	25	12	1,359
10	96	4,868	26	57	3,296
11	94	5,021	27	54	3,472
12	91	4,811	28	65	3,264
13	72	3,580	29	77	3,925
14	60	2,800	30	85	4,002
15	48	2,269	31	92	4,583
16	53	2,748	32	82	3,523

Required

a. The company uses the number of machine hours as the cost driver for factory supplies costs. Use an algebraic equation to describe how total factory supplies costs can be estimated.

b. Use a spreadsheet program to perform a regression analysis. Use factory supplies costs as the dependent variable (Y) and the machine hours as the independent variable (X). Determine the total fixed cost per week and variable cost per machine hour.

c. Identify the R^2 statistic provided by the Excel program and explain what it means.

d. Identify a potential weakness of regression analysis and explain what can be done to minimize it.

e. Determine the estimated total cost of factory supplies, if machine hour usage amounts to 100 hours for the next week. What portion of the total cost is fixed and what portion is variable?

ANALYZE, THINK, COMMUNICATE

ATC 2-1   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

a. Determine which company appears to have the higher operating leverage.

b. Write a paragraph or two explaining why the company you identified in Requirement *a* might be expected to have the higher operating leverage.

c. If revenues for both companies declined, which company do you think would likely experience the greater decline in operating earnings? Explain your answer.

ATC 2-2   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

a. In front of the class, present a statement showing the expected net income assuming 500 people buy tickets.

b. The instructor will divide the class into groups and then organize the groups into four sections. The instructor will assign one of the following tasks to each section of groups.

Group Tasks

(1) 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.

(2) 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.

(3) 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.

(4) 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.

c. 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.

d. Draw conclusions regarding the risks and rewards associated with operating leverage. At a minimum, answer the following questions:

(1) 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) faces 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 2-3　Research Assignment　*Fixed versus variable cost*

Use the 2008 Form 10-K for **Black & Decker Corp. (B&D)** (not StanleyBlack & Decker) to complete the requirements below. To obtain the Form 10-K you can use either use the EDGAR system following the instructions in Appendix A, or it can be found under "Investor Relations" on the company's corporate website at **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 $146.0 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 they be considered as primarily fixed or variable in nature?

ATC 2-4　Writing Assignment　*Cost averaging*

Candice Sterling is a veterinarian. She has always been concerned for the pets of low-income families. These families love their pets but frequently do not have the means to provide them proper veterinary care. Dr. Sterling decides to open a part-time veterinary practice in a low-income neighborhood. She plans to volunteer her services free of charge two days per week. Clients will be charged only for the actual costs of materials and overhead. Dr. Sterling leases a small space for $300 per month. Utilities and other miscellaneous costs are expected to be approximately $180 per month. She estimates the variable cost of materials to be approximately $10 per pet served. A friend of Dr. Sterling who runs a similar type of clinic in another area of town indicates that she should expect to treat the following number of pets during her first year of operation.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
18	26	28	36	42	54	63	82	42	24	20	15

Dr. Sterling's friend has noticed that visits increase significantly in the summer because children who are out of school tend to bring their pets to the vet more often. Business tapers off during the winter and reaches a low point in December when people spend what little money they have on Christmas presents for their children. After looking at the data, Dr. Sterling

becomes concerned that the people in the neighborhood will not be able to afford pet care during some months of operation even if it is offered at cost. For example, the cost of providing services in December would be approximately $42 per pet treated ($480 overhead ÷ 15 pets = $32 per pet, plus $10 materials cost). She is willing to provide her services free of charge, but she realizes that she cannot afford to subsidize the practice further by personally paying for the costs of materials and overhead in the months of low activity. She decides to discuss the matter with her accountant to find a way to cut costs even more. Her accountant tells her that her problem is cost *measurement* rather than cost *cutting*.

Required

Assume that you are Dr. Sterling's accountant. Write a memo describing a pricing strategy that resolves the apparent problem of high costs during months of low volume. Recommend in your memo the price to charge per pet treated during the month of December.

ATC 2-5   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 2011, 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 2011, 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 2012, 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 2012 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 1.15 of Chapter 1 and comment on whether Mr. Borrough's recommendation violated any of the standards in the code of ethical conduct.

d. Comment on your belief regarding the adequacy of the Standards of Ethical Conduct for Managerial Accountants to direct the conduct of management accountants.

e. Are the actions of Ray Borrough in violation of the provisions of Sarbanes-Oxley that were described in Chapter 1? Explain your answer.

ATC 2-6   Spreadsheet Assign ment   *Using Excel*

Charlie Stork rented a truck for his business on two previous occasions. Since he will soon be renting a truck again, he would like to analyze his bills and determine how the rental fee is calculated. His two bills for truck rental show that on September 1, he drove 1,000 miles and the bill was $1,500, and on December 5, he drove 600 miles and the bill was $1,380.

Required

Construct a spreadsheet to calculate the variable and fixed costs of this mixed cost that will allow Mr. Stork to predict his cost if he drives the truck 700 miles. The cells that show as numbers should all be formulas except C5, C6, E5, E6, and C18. Constructing the spreadsheet in this manner will allow you to change numbers in these five cells to recalculate variable cost, fixed cost, or predicted total cost.

	A	B	C	D	E	F	G	H
	ch02-working.xls							
1	Chapter 2 - Working with Excel					Name:		
2								
3			Rental		Miles			
4			Cost		Driven			
5		High	$ 1,500		1,000			
6		Low	1,380		600			
7		Difference	$ 120		400			
8								
9		Variable cost per mile =			Change in Total Cost/Change in Miles			
10		Variable cost per mile =			$ 0.30 per mile			
11								
12		Fixed cost =	Total Cost - Variable Cost					
13		Fixed cost =	$ 1,200					
14								
15								
16		Predicted Cost =	$ 1,200 + $ 0.30 per mile x Predicted Mileage					
17								
18		If predicted mileage is: 700						
19								
20		Predicted Cost = $ 1,410						
21								

Spreadsheet Tip

1. To format cells to show dollar signs, commas, or both, choose Format, then Cells, then click on the tab titled Numbers, and choose Accounting.

ATC 2-7   Spreadsheet Assignment   *Mastering Excel*

Siwa Company makes and sells a decorative ceramic statue. Each statue costs $50 to manufacture and sells for $75. Siwa spends $3 to ship the statue to customers and pays salespersons a $2 commission for each statue sold. The remaining annual expenses of operation are administrative salaries, $70,000; advertising, $20,000; and rent, $30,000. Siwa plans to sell 9,000 statues in the coming year.

	A	B	C	D	E	F	G	H	I	J	K
1	Chapter 2 - Mastering Excel								Name:		
2											
3											
4		**Contribution Margin Format Income Statement**									
5											
6		Sales Revenue		(9,000 x $75)							$675,000
7		Variable Expenses									
8		Cost of Goods Sold		(9,000 x $50)				$450,000			
9		Sales Commissions		(9,000 x $ 2)				18,000			
10		Shipping Expenses		(9,000 x $ 3)				27,000			495,000
11		Contribution Margin									$180,000
12		Fixed Expenses									
13		Administrative Salaries						$ 70,000			
14		Advertising						20,000			
15		Rent						30,000			120,000
16		Net Income									$ 60,000
17											
18											
19		Operating Leverage									3.00
20											

Required

Construct a spreadsheet that shows a contribution margin format income statement and that calculates operating leverage. Place formulas in the spreadsheet to allow changes to any of the preceding information to be automatically reflected in the income statement and operating leverage.

COMPREHENSIVE PROBLEM

Use the same transaction data for Magnificent Modems, Inc., as was used in Chapter 1 (see page 52).

Required

a. Based on these data, identify each cost incurred by the company as (1) fixed versus variable relative to the number of units produced and sold; and (2) product versus selling, general, and administrative (S,G,&A). The solution for the first item is shown as an example.

Cost Item	Fixed	Variable	Product	S,G,&A
Depreciation on manufacturing equipment	X		X	
Direct materials				
Direct labor				
Production supplies				
Rent on manufacturing facility				
Sales commissions				
Depreciation on administrative equipment				
Administrative costs (rent and salaries)				

b. Replace the question marks in the following table to indicate the product cost per unit assuming levels of production of 5,000, 6,000, 7,000, and 8,000.

Cost of goods sold	$455,000	?	?	?
Divided by number of units	5,000	6,000	7,000	8,000
Cost per unit	$ 91	?	?	?