

Chapter Review

Problems

Problem 3-40

Identifying Fixed, Variable, Mixed, and Step Costs

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs. 2 - Define and describe mixed and step costs.

Consider each of the following independent situations:

- a. A computer service agreement in which a company pays \$150 per month and \$15 per hour of technical time
- b. Fuel cost of the company's fleet of motor vehicles
- c. The cost of beer for a bar
- d. The cost of computer printers and copiers in your college
- e. Rent for a dental office
- f. The salary of a receptionist in a law firm
- g. The wages of counter help in a fast-food restaurant
- h. The salaries of dental hygienists in a three-dentist office. One hygienist can take care of 120 cleanings per month
- i. Electricity cost which includes a \$15 per month billing charge and an additional amount depending on the number of kilowatt-hours used

Required:

1. For each situation, describe the cost as one of the following: fixed cost, variable cost, mixed cost, or step cost. (*Hint:* First, consider what the driver or output measure is. If additional assumptions are necessary to support your cost type decision, be sure to write them down.)

Example: Raw materials used in production—Variable cost

2. **CONCEPTUAL CONNECTION** Change your assumption(s) for each situation so that the cost type changes to a different cost type. List the new cost type and the changed assumption(s) that gave rise to it.

Example: Raw materials used in production. Changed assumption—the materials are difficult to obtain, and a year's worth must be contracted for in advance. Now, this is a fixed cost. (This is the case with diamond sales by **DeBeers Inc.** to its sightholders. See the following website for information: www.keyguide.net/sightholders/.)

Problem 3-41

Identifying Use of the High-Low, Scattergraph, and Least Squares Methods

OBJECTIVE 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Consider each of the following independent situations:

- a. Shaniqua Boyer just started her new job as controller for St. Matthias General Hospital. She wants to get a feel for the cost behavior of various departments of the hospital. Shaniqua first looks at the radiology department. She has annual data on total cost and the number of procedures that have been run for the past 15 years. However, she knows that the department upgraded its equipment substantially 2 years ago and is doing a wider variety of tests. So, Shaniqua decides to use data for just the past 2 years.
- b. Francis Hidalgo is a summer intern in the accounting department of a manufacturing firm. His boss assigned him a special project to determine the cost of manufacturing a special order. Francis needs information on variable and fixed overhead, so he gathers monthly data on overhead cost and machine hours for the past 60 months and enters them into his personal computer. A few keystrokes later, he has information on fixed and variable overhead costs.
- c. Ron Wickstead sighed and studied his computer printout again. The results made no sense to him. He seemed to recall that sometimes it

helped to visualize the cost relationships. He reached for some graph paper and a pencil.

- d. Lois March had hoped that she could find information on the actual cost of promoting new products. Unfortunately, she had spent the weekend going through the files and was only able to find data on the total cost of the sales department by month for the past 3 years. She was also able to figure out the number of new product launches by month for the same time period. Now, she had just 15 minutes before a staff meeting in which she needed to give the vice president of sales an expected cost of the average new product launch. A light bulb went off in her head, and she reached for paper, pencil, and a calculator.

Required:

Determine which of the following cost separation methods is being used: the high-low method, the scattergraph method, or the method of least squares.

Problem 3-42

Identifying Variable Costs, Committed Fixed Costs, and Discretionary Fixed Costs

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs.

Required:

Classify each of the following costs for a jeans manufacturing company as a variable cost, committed fixed cost, or discretionary fixed cost.

- a. The cost of buttons
- b. The cost to lease warehouse space for completed jeans—the lease contract runs for 2 years at \$5,000 per year
- c. The salary of a summer intern
- d. The cost of landscaping and mowing the grass—the contract with a local mowing company runs from month to month
- e. Advertising in a national magazine for teenage girls
- f. Electricity to run the sewing machines

- g. Oil and spare needles for the sewing machines
- h. Quality training for employees—typically given for four hours at a time, every six months
- i. Food and beverages for the company Fourth of July picnic
- j. Natural gas to heat the factory during the winter

Use the following information for **Problems 3-43 and 3-44**:

Farnsworth Company has gathered data on its overhead activities and associated costs for the past 10 months. Tracy Heppler, a member of the controller's department, has convinced management that overhead costs can be better estimated and controlled if the fixed and variable components of each overhead activity are known. One such activity is receiving raw materials (unloading incoming goods, counting goods, and inspecting goods), which she believes is driven by the number of receiving orders. Ten months of data have been gathered for the receiving activity and are as follows:

Month	Receiving Orders	Receiving Cost
1	1,000	\$18,000
2	700	15,000
3	1,500	28,000
4	1,200	17,000
5	1,300	25,000
6	1,100	21,000
7	1,600	29,000
8	1,400	24,000
9	1,700	27,000
10	900	16,000

Problem 3-43

Scattergraph, High-Low Method, and Predicting Cost for a Different Time Period from the One Used to Develop a Cost Formula

OBJECTIVE 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Refer the the information for Farnsworth Company above.

Required:



1. Prepare a scattergraph based on the 10 months of data. Does the relationship appear to be linear?
2. Using the high-low method, prepare a cost formula for the receiving activity. Using this formula, what is the predicted cost of receiving for a month in which 1,450 receiving orders are processed?
3. Prepare a cost formula for the receiving activity for a quarter. Based on this formula, what is the predicted cost of receiving for a quarter in which 4,650 receiving orders are anticipated? Prepare a cost formula for the receiving activity for a year. Based on this formula, what is the predicted cost of receiving for a year in which 18,000 receiving orders are anticipated?

Problem 3-44

Method of Least Squares, Predicting Cost for Different Time Periods from the One Used to Develop a Cost Formula

OBJECTIVE 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Refer to the information for Farnsworth Company on the previous page. However, assume that Tracy has used the method of least squares on the receiving data and has gotten the following results:

Intercept	3,212
Slope	15.15

Required:

1. Using the results from the method of least squares, prepare a cost formula for the receiving activity.
2. Using the formula from Requirement 1, what is the predicted cost of receiving for a month in which 1,450 receiving orders are processed? (*Note:* Round your answer to the nearest dollar.)
3. Prepare a cost formula for the receiving activity for a quarter. Based on this formula, what is the predicted cost of receiving for a quarter in which 4,650

receiving orders are anticipated? Prepare a cost formula for the receiving activity for a year. Based on this formula, what is the predicted cost of receiving for a year in which 18,000 receiving orders are anticipated?

Problem 3-45

Cost Behavior, High-Low Method, Pricing Decision

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs. **2** - Define and describe mixed and step costs. **3** - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Fonseca, Ruiz, and Dunn is a large, local accounting firm located in a southwestern city. Carlos Ruiz, one of the firm's founders, appreciates the success his firm has enjoyed and wants to give something back to his community. He believes that an inexpensive accounting services clinic could provide basic accounting services for small businesses located in the barrio. He wants to price the services at cost.

Since the clinic is brand new, it has no experience to go on. Carlos decided to operate the clinic for two months before determining how much to charge per hour on an ongoing basis. As a temporary measure, the clinic adopted an hourly charge of \$25, half the amount charged by Fonseca, Ruiz, and Dunn for professional services.

The accounting services clinic opened on January 1. During January, the clinic had 120 hours of professional service. During February, the activity was 150 hours. Costs for these two levels of activity usage are as follows:

	120 Professional Hours	150 Professional Hours
Salaries:		
Senior accountant	\$2,500	\$2,500
Office assistant	1,200	1,200
Internet and software subscriptions	700	850
Consulting by senior partner	1,200	1,500
Depreciation (equipment)	2,400	2,400
Supplies	905	1,100
Administration	500	500
Rent (offices)	2,000	2,000
Utilities	332	365

Required:

1. Classify each cost as fixed, variable, or mixed, using hours of professional service as the activity driver.
2. Use the high-low method to separate the mixed costs into their fixed and variable components. (*Note:* Round variable rates to two decimal places and fixed amounts to the nearest dollar.)
3. Luz Mondragon, the chief paraprofessional of the clinic, has estimated that the clinic will average 140 professional hours per month. If the clinic is to be operated as a nonprofit organization, how much will it need to charge per professional hour? How much of this charge is variable? How much is fixed? (*Note:* Round answers to two decimal places.)
4. **CONCEPTUAL CONNECTION** Suppose the accounting center averages 170 professional hours per month. How much would need to be charged per hour for the center to cover its costs? Explain why the per-hour charge decreased as the activity output increased. (*Note:* Round answers to two decimal places.)

Problem 3-46

Flexible and Committed Resources, Capacity Usage for a Service

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs. 2 - Define and describe mixed and step costs. 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Jana Morgan is about to sign up for cellular telephone service. She is primarily interested in the safety aspect of the phone; she wants to have one available for emergencies. She does not want to use it as her primary phone. Jana has narrowed her options down to two plans:

	Plan 1	Plan 2
Monthly fee	\$ 20	\$ 30
Free local minutes	60	120
Additional charges per minute:		
Airtime	\$ 0.40	\$ 0.30
Long distance	0.15	—
Regional roaming	0.60	—
National roaming	0.60	0.60

Both plans are subject to a \$25 activation fee and a \$120 cancellation fee if the service is cancelled before 1 year. Jana's brother will give her a cell phone that he no longer needs. It is not the latest version (and is not Internet capable) but will work well with both plans.

Required:

1. Classify the charges associated with the cellular phone service as (a) committed resources or (b) flexible resources.
2. **CONCEPTUAL CONNECTION** Assume that Jana will use, on average, 45 minutes per month in local calling. For each plan, split her minute allotment into used and unused capacity. Which plan will be most cost effective? Why?
3. **CONCEPTUAL CONNECTION** Assume that Jana loves her cell phone and ends up talking frequently with friends while traveling within her region. On average, she uses 60 local minutes a month and 30 regional minutes. For each plan, split her minute allotment into used and unused capacity. Which plan will be most cost effective? Why?
4. **CONCEPTUAL CONNECTION** Analyze your own cellular phone plan by comparing it with other possible options.

Problem 3-47

Variable and Fixed Costs, Cost Formula, High-Low Method

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs. 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares.

Li Ming Yuan and Tiffany Shaden are the department heads for the accounting department and human resources department, respectively, at a large textile firm in the southern United States. They have just returned from an executive meeting at which the necessity of cutting costs and gaining efficiency has been stressed. After talking with Tiffany and some of her staff members, as well as his own staff members, Li Ming discovered that there were a number of costs associated with the claims processing activity. These costs included the salaries of the two paralegals who worked full-time on claims processing; the salary of the accountant who cut the checks; the cost of claims forms, checks, envelopes, and postage; and depreciation on the office equipment dedicated to the processing. Some of the paralegals' time is spent in the routine processing of uncontested claims, but much time is spent on the claims that have incomplete documentation or are contested. The accountant's time appears to vary with the number of claims processed.

Li Ming was able to separate the costs of processing claims from the costs of running the departments of accounting and human resources. He gathered the data on claims processing cost and the number of claims processed per month for the past six months. These data are as follows:

Month	Claims Processing Cost	Number of Claims Processed
February	\$34,907	5,700
March	31,260	4,900
April	37,950	6,100
May	38,250	6,500
June	44,895	7,930
July	44,055	7,514

Required:

1. Classify the claims processing costs that Li Ming identified as variable and fixed.
2. What is the independent variable? The dependent variable?
3. Use the high-low method to find the fixed cost per month and the variable rate. What is the cost formula?
4. **CONCEPTUAL CONNECTION** Suppose that an outside company bids on the claims processing business. The bid price is \$4.60 per claim. If Tiffany expects 75,600 claims next year, should she outsource the claims processing or continue to do it in-house?

Problem 3-48

Cost Separation

OBJECTIVE 1 - Explain the meaning of cost behavior, and define and describe fixed and variable costs. 2 - Define and describe mixed and step costs.

About 8 years ago, **Kicker** faced the problem of rapidly increasing costs associated with workplace accidents. The costs included the following:



State unemployment insurance premiums	\$100,000
Average cost per injury	\$ 1,500
Number of injuries per year	15
Number of serious injuries	4
Number of workdays lost	30

A safety program was implemented with the following features: hiring a safety director, new employee orientation, stretching required four times a day, and systematic monitoring of adherence to the program by directors and supervisors. A year later, the indicators were as follows:

State unemployment insurance premiums	\$50,000
Average cost per injury	\$ 50
Number of injuries per year	10
Number of serious injuries	0
Number of workdays lost	0
Safety director's starting salary	\$60,000

Required:

1. **CONCEPTUAL CONNECTION** Discuss the safety-related costs listed. Are they variable or fixed with respect to speakers sold? With respect to other independent variables (describe)?
2. **CONCEPTUAL CONNECTION** Did the safety program pay for itself? Discuss your reasoning.

Problem 3-49

(Appendix 3A) Method of Least Squares

OBJECTIVE 4 - (Appendix 3A) Use a personal computer spreadsheet program to perform the method of least squares.

Refer to the information for Farnsworth Company for the first 10 months of data on receiving orders and receiving cost. Now suppose that Tracy has gathered two more months of data:



Month	Receiving Orders	Receiving Cost
11	1,200	\$28,000
12	950	17,500

Note: For the following requirements, round the intercept terms to the nearest dollar, round the variable rates to the nearest cent, and R-squared to two decimal places.

Required:

- Run two regressions using a computer spreadsheet program such as Excel. First, use the method of least squares on the first 10 months of data. Then, use the method of least squares on all 12 months of data. Write down the results for the intercept, slope, and R^2 for each regression. Compare the results.
- CONCEPTUAL CONNECTION** Prepare a scattergraph using all 12 months of data. Do any points appear to be outliers? Suppose Tracy has learned that the factory suffered severe storm damage during Month 11 that required extensive repairs to the receiving area—including major repairs on a forklift. These expenses, included in Month 11 receiving costs, are not expected to recur. What step might Tracy, using her judgment, take to amend the results from the method of least squares?
- CONCEPTUAL CONNECTION** Rerun the method of least squares, using all the data except for Month 11. (You should now have 11 months of data.) Prepare a cost formula for receiving based on these results, and calculate the predicted receiving cost for a month with 1,450 receiving orders. Discuss the results from this regression versus those from the regression for 12 months of data.

(Appendix 3A) Scattergraph, High-Low Method, Method of Least Squares, Use of Judgment

OBJECTIVE 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares. 4 - (Appendix 3A) Use a personal computer spreadsheet program to perform the method of least squares.

The management of Wheeler Company has decided to develop cost formulas for its major overhead activities. Wheeler uses a highly automated manufacturing process, and power costs are a significant manufacturing cost. Cost analysts have decided that power costs are mixed. The costs must be broken into their fixed and variable elements so that the cost behavior of the power usage activity can be properly described. Machine hours have been selected as the activity driver for power costs. The following data for the past eight quarters have been collected:

Quarter	Machine Hours	Power Cost
1	20,000	\$26,000
2	25,000	38,000
3	30,000	42,500
4	22,000	37,000
5	21,000	34,000
6	18,000	29,000
7	24,000	36,000
8	28,000	40,000

Note: For the following requirements, round the fixed cost to the nearest dollar, round the variable rates to the nearest cent, and the R-squared to two decimal places.

Required:

1. Prepare a scattergraph by plotting power costs against machine hours. Does the scattergraph show a linear relationship between machine hours and power cost?
2. Using the high and low points (i.e., the high-low method), compute a power cost formula. (*Note:* Round answers to three decimal places.)
3. Use the method of least squares to compute a power cost formula. Evaluate the coefficient of determination.
4. **CONCEPTUAL CONNECTION** Rerun the regression, and drop the point (20,000, \$26,000) as an outlier. Compare the results from this regression to

those for the regression in Requirement 3. Which is better?

Problem 3-51

(Appendix 3A) Separating Fixed and Variable Costs, Service Setting

OBJECTIVE 3 - Separate mixed costs into their fixed and variable components using the high-low method, the scattergraph method, and the method of least squares. 4 - (Appendix 3A) Use a personal computer spreadsheet program to perform the method of least squares.

Louise McDermott, controller for the Galvin plant of Veromar Inc., wanted to determine the cost behavior of moving materials throughout the plant. She accumulated the following data on the number of moves (from 100 to 800 in increments of 100) and the total cost of moving materials at those levels of moves:

Number of Moves	Total Cost
100	\$ 3,000
200	4,650
300	3,400
400	8,500
500	10,000
600	12,600
700	13,600
800	14,560

Required:

1. Prepare a scattergraph based on these data. Use cost for the vertical axis and number of moves for the horizontal. Based on an examination of the scattergraph, does there appear to be a linear relationship between the total cost of moving materials and the number of moves?
2. Compute the cost formula for moving materials by using the high-low method. Calculate the predicted cost for a month with 550 moves by using the high-low formula. (Note: Round the answer for the variable rate to three decimal places and the answer for total fixed cost and total cost to the nearest dollar.)
3. **CONCEPTUAL CONNECTION** Compute the cost formula for moving materials using the method of least squares. (Note: For the method of least squares, round the variable rate to two decimal places and total fixed cost and

- total cost to the nearest dollar.) Using the regression cost formula, what is the predicted cost for a month with 550 moves? What does the coefficient of determination tell you about the cost formula computed by regression?
4. **CONCEPTUAL CONNECTION** Evaluate the cost formula using the least squares coefficients. Could it be improved? Try dropping the third data point (300, \$3,400), and rerun the regression.

Chapter 3: Cost Behavior Problems

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